2004 Hamilton Road
Environmental Impact Study

Prepared for:
Kreative Development Inc.

Prepared by:
Meghan Douglas
Terrestrial and Wetland Biologist
Natural Resource Solutions Inc.
415 Phillip Street, Unit C
Waterloo, ON
N2L 3X2

To be submitted to the City of London –
Long Range Planning, Research & Ecology
Planning & Development Department

Project No. 2632 l June 2025

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Executive Summary

Natural Resource Solutions Inc. (NRSI) was retained in April 2021 by Kreative Development Inc. to complete an Environmental Impact Study (EIS) for a proposed development on the east side of London, Ontario. The proposed development includes a mixture of commercial and industrial development blocks and associated roads, which includes a proposed crossing over Fekete Drain.

The subject lands are approximately 16ha in size. The lands currently consist of cultural meadow, cultural woodland, small wetlands, a mature contiguous woodland in the north, and the Fekete Drain and associated riparian habitat that crosses the property in a north-south direction. Hedgerows and landscape trees in the southeast corner of the subject lands indicated the location of a former homestead. The subject lands are located within the Dorchester Corridor subwatershed and are within Ecoregion 7E.

Natural heritage information was collected and reviewed to identify key natural heritage features, habitats and species that are reported from, or have the potential to occur within the study area. A comprehensive suite of terrestrial and aquatic surveys was conducted in 2021 and 2022 to characterize the subject lands, which included but were not limited to Ecological Land Classification (ELC), a three-season vegetation inventory, woodland and wetland boundary delineations, snake coverboard surveys, anuran call surveys, breeding and migratory bird surveys, aquatic habitat assessment, benthic invertebrate surveys, and fish community surveys. Field surveys meet the City's requirements, as discussed during a scoping meeting held November 13, 2024.

Several significant and sensitive natural features are present within the subject lands and study area. Several small wetlands are present, which are not considered provincially significant. These features were delineated with the UTRCA on June 21, 2022. A large woodland in the north of the subject lands and study area, as well as woodlands along the Fekete Drain have been identified as significant in accordance with the London Plan. The boundary of the woodland was determined in consultation with the City of London on June 21, 2022. Significant Valleyland associated with the Fekete Drain bisects the western half of the subject lands. A Cultural Savannah community and Cultural Woodland community were determined to not meet the City's definition of significance. The limits of the Meadowlily Woods Environmentally Significant Area were revised to only include the greatest limit of either the Significant

Woodland, and or the revised Significant Valleyland where the feature overlaps the Significant Woodland as per the guidance received from the City of London ecology staff.

Based on the site review, no candidate bat roosting trees were identified within the area where tree removals are anticipated (southeast and southwest corners). Candidate SAR bat habitat is located within the woodland, including all treed communities (FOD, CUP, CUS). Significant Wildlife Habitat (SWH) has been confirmed for Terrestrial Crayfish and Eastern Wood-Pewee. Candidate SWH has been identified in the study area for Bat Maternity Colonies, Woodland Raptor Nesting Habitat, and Woodland Area-Sensitive Bird Breeding Habitat. Additionally, regionally significant vascular plant species have been identified from vegetation communities within the subject lands.

Comprehensive buffers have been identified for significant and sensitive natural features within the subject lands. A 30m buffer has been identified on either side of the Fekete Drain, notwithstanding the proposed crossing. A 30m buffer has been identified from the Significant Woodland and both Terrestrial Crayfish habitats, except for one small area of buffer encroachment due to the proposed drain crossing. Several small wetlands and portions of wetlands are proposed for removal from the subject lands in support of the proposed development. Four small MAM2 communities are proposed to be partially removed / impacted, which will be compensated for at a ratio of more than 1:1 within the subject lands. The removal of treed vegetation communities will be compensated for within the additional compensation lands. A pathway is proposed to be integrated into the outer buffer of the natural heritage features and will connect through the proposed Fekete Drain crossing.

An assessment of potential impacts resulting from the proposed development has been completed as part of this study. No significant negative impacts are anticipated as long as recommended mitigation, compensation, and restoration measures are implemented. Restoration plantings will provide a robust corridor along the Fekete Drain and further improve the ecological function of the Meadowlily Woods Environmentally Significant Area to result in a net positive effect.

At this stage of the proposed project, the intent and requirements of all environmental policies of the City of London Plan, the Provincial Planning Statement, and other relevant legislation have been met. Recommendations are provided within this report for the detailed design stage of the

development to ensure that all relevant policies and regulations continue to be met, which include, but are not limited to:

- Development of a comprehensive Grading Plan for the proposed development.
- Development of a Tree Inventory and Preservation Plan (TIPP) to address tree removals and compensation requirements for the proposed development.
- Development of a detailed Stormwater Management (SWM) Plan and updated feature-based water balance to ensure the post-development water budget is within 10% of the pre-development water budget.
- Development of a Restoration Plan to include a planting plan for the buffer areas within the subject lands.
- Development of a wetland compensation plan addressing hydrologic requirements for the wetland and potential Low Impact Development measures, as well as a planting plan for the wetland.
- Development of an Environmental Monitoring Plan (EMP) to identify management and monitoring requirements during and post-construction.
- Development of a detailed Erosion and Sediment Control (ESC) Plan by a qualified engineer.
- Development of a detailed Salt Management Plan by a qualified specialist.

2004 Hamilton Road
Environmental Impact Study

Project Team:

Katharina Richter	Senior Biologist, Project Advisor
Meghan Douglas	Terrestrial & Wetland Biologist, Project Manager
Pat Deacon	Terrestrial & Wetland Biologist
Blair Baldwin	Aquatic Biologist
Monica Varga	GIS Analyst

Report submitted on June 11, 2025

Meghan Douglas
Project Manager
Terrestrial & Wetland Biologist

Katharina Richter
Senior Biologist
Project Advisor

TABLE OF CONTENTS

List of Tables

List of Figures

List of Maps

List of Appendices

1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained in April 2021 by Kreative Development Inc. to complete an Environmental Impact Study (EIS) for the proposed development of the property located at 2004 Hamilton Road in London, Ontario.

A Subject Lands Status Report (SLSR), which included background species information for the subject lands, as well the results of original field surveys, and identification of sensitive and significant features of the study area, was prepared and submitted to the City of London as part of the scoping process on November 7, 2024. The information within the SLSR, as well through discussions with the City of London were used to inform the Draft Plan and this EIS.

For the purposes of this report, the term “subject lands” refers to the southern portion of a property owned by the proponent, that is proposed for development. The term “study area” refers to the subject lands plus the adjacent lands (120m and natural heritage features that extend beyond, included within the property) for which additional information was collected and reviewed, as could be gathered without direct access to these areas) (Map 1). Legacy data collected from agencies encompassed the study area to ensure that all surrounding natural features were considered.

The study area, shown on Map 1, is approximately 45ha in area, with the subject lands being approximately 16ha in area. The subject lands are located on the east side of London, bordering Veterans Memorial Parkway and agricultural fields to the east; Hamilton Road and industrial lands with some agricultural fields to the south; a horse race track, stables, and agricultural fields to the west; and forest to the north. The property borders the Thames River on the north side. The subject lands are currently characterized by cultural meadow, with mature woodland on the northern edge and along the Fekete Drain, and small wetlands within the meadow. The Meadowlily Woods Environmentally Significant Area (ESA) is identified within the mature woodland, and was refined through this study. Hedgerows and landscape trees in the southeast corner of the subject lands indicated the location of a former homestead.

The City of London’s Official Plan, referred to as the London Plan, mapping (2023; Map 1 - Place Types) identifies the subject lands as Light Industrial and Green Space. The subject lands are located within Ecoregion 7E, and are within the Upper Thames River watershed, and the Dorchester Corridor subwatershed (City of London 2023). The London Plan mapping (2023;

Map 5, Natural Heritage) shows Significant Valleyland associated with Fekete Drain, Unevaluated Wetland and ESA (Meadowlily Woods). The wooded areas within the study area are located within the City of London Tree Protection Area.

Based on the London Plan (City of London 2023) and Ontario Regulation 41/24 Prohibited Activities, Exemptions, and Permits (Government of Ontario 2024), any development within or adjacent to the identified significant features outlined above requires the preparation of an EIS. As the SLSR had been developed in accordance with the City of London's Environmental Management Guidelines (2021a), this EIS has utilized the SLSR information, but the report has been updated to be in accordance with the *City of London Environmental Management Guidelines* (2021a), which includes guidelines for the preparation of EISs.

This report contains the findings of the SLSR including the characterization of existing natural features based on the results of a background review, original field investigations, and discussions with agency staff. The characterization was used to inform an analysis of the significance and sensitivity of natural features, the identification of natural feature constraints in association with land use policy designations, and the assessment of potential impacts and mitigation measures associated with details of the proposed development.

1.1 Policy Context

Natural features identified during background review and the detailed field investigations were evaluated against relevant policies and legislation to help inform suitable land-use concepts, guide the layout of development, and identify areas to be protected. **Error! Reference source not found.** provides an overview of policies and the analysis of natural features within the subject lands.

Table 1. Relevant Policies, Legislation and Planning Studies

Policy/Legislation/Plan	Description	Project Relevance

Provincial Planning Statement (OMMAH 2024).	• Issued under the authority of Section 3 of the Planning Act and came into effect on October 20, 2024, replacing the 2020 PPS.
	• Section 4.1 of the PPS – Natural Heritage establishes clear direction on the adoption of an ecosystem approach and the protection of resources that have been identified as 'significant'.
	• The Natural Heritage Reference Manual (OMNR 2010) and the Significant Wildlife Habitat Technical Guide (OMNR 2000) and associated criteria schedules (OMNR 2015) were prepared by the MNRF to provide guidance on identifying natural features and in interpreting the Natural Heritage sections of the PPS.
		• Natural features that occur or may occur within the study area, and which receive protection under the PPS, include:
		  • Significant Wetlands,
		  • Significant Woodlands,
		  • Significant Valleylands,
		  • Fish Habitat,
		  • Potential Significant Wildlife Habitat, and
		  • Potential habitat for Endangered and Threatened species.
		• Section 4.1.2 of the PPS states that the connectivity of natural features in an area should be maintained, restored, or where possible, improved.
		• Section 4.1.4 of the PPS states that development or site alteration shall not be permitted in Significant Wetlands located in Ecoregion 7E (in which the study area is located).
		• Section 4.1.5 of the PPS states that development or site alteration shall not be permitted in Significant Woodlands, Significant Valleylands, and Significant Wildlife Habitat unless it has been demonstrated that there will be no negative impacts on the features or their ecological functions.
		• Section 4.1.6 of the PPS states that development or site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.
		• Section 4.1.7 of the PPS states that development or site alteration shall not be permitted in SAR habitat except in accordance with provincial and federal requirements.
		• Section 4.1.8 of the PPS states that development and site alteration shall not be permitted on adjacent lands to the natural features described above, unless it is

Policy/Legislation/Plan	Description	Project Relevance
		demonstrated that there will be no negative impacts to the natural features or their ecological functions.
Endangered Species Act (2007)	• Prohibits the killing, harming, harassing, or capturing of Endangered and Threatened species and protects their habitats from damage and destruction.	• Multiple SAR were identified as having the potential to occur within the study area based on presence of suitable habitat.
Migratory Birds Convention Act (1994)	• Prohibits the disturbance, destruction, or taking of a nest or eggs of migratory birds.	• Any vegetation removal required for construction of the proposed development must have regard for this legislation in the form of timing window restrictions or other suitable mitigation measures.
Fish and Wildlife Conservation Act (1997)	• Provides protection for certain bird species not protected under the Migratory Birds Convention Act (e.g. raptors), as well as many furbearing mammals and their dens or habitual dwellings.	• Construction activities must have consideration for bird nesting and den sites of furbearing mammals.
Canadian Fisheries Act (1985)	• Manages threats to all fish and fish habitats in Canada. • The Act prohibits harmful alteration, disruption, or destruction of fish habitat (HADD). • DFO has developed an assessment tool, where proponents can determine whether their project activities require DFO review based on the type of water body the work is occurring in and the nature of the proposed activity.	• Fekete Drain provides Fish Habitat. • Any works within Fekete Drain must have regard for this legislation and review through DFO may be required.
The London Plan (2024)	• The London Plan is the City of London's Official Plan. It was adopted by City Council in June 2016 and approved by the Minister December 2016. The most recent version was consolidated in June 2024. It outlines current policies for the protection of natural features within the City of London. • The Natural Heritage policies establish requirements for the identification, delineation and protection of the natural heritage features and areas that form the City of London's Natural Heritage System. • In the review of any planning and development application, an initial review of the lands (SLSR)	• Map 1 of the Plan identifies portions of the subject lands as Green Space and Light Industrial. • Map 4 of the Plan identifies a multi-use pathway on the subject lands. • Map 5 of the Plan indicates the presence of Environmentally Significant Area (Meadowlily Woods), Unevaluated Wetland, Significant Valleylands, and a watercourse (Fekete Drain) • Map 6 of the Plan indicates the presence of Significant Groundwater Recharge Areas and Highly Vulnerable Aquifers

Policy/Legislation/Plan	Description	Project Relevance
	shall be undertaken to confirm the presence or absence of any natural features and areas that may be present that have not been mapped to determine if further evaluation of the feature is required.	• London Plan has Environmental Policies for the protection, management, and enhancement of environmental features. o Policy 1323 & 1324 refer to Fish Habitat o Policy 1325 to 1329 refer to SAR Habitat o Policy 1330 to 1336 refer to wetlands. Policy 1332 identifies the need for OWES on unevaluated wetland features. Policy 1334 identifies that for non-Provincially Significant Wetlands the City may consider replacement on at least a 1:1 ratio. o Policy 1337 to 1343 refer to Significant Woodlands and Woodland features. Policy 1341 identifies how to determine Significance of a Woodland o Policy 1344 to 1350 refer to Significant Valleylands. o Policy 1351 refers to Alteration to River, Stream Valleys and Watercourses. o Policy 1352 to 1355 refer to SWH o Policy 1361 to 1366 refer to Water Resource Systems. o Policy 1367 to 1371 refer to ESAs.
City of London Environmental Management Guidelines (2021)	• Outlines policy guidelines, standards, processes and procedures for the preparation and review of SLSR and EIS, determination of buffers and setbacks, and evaluation of significant woodlands, as required by the City of London.	• As this development application is within 120m of significant natural heritage features, an EIS is required and as such, the Environmental Management Guidelines were to be followed through the project steps including data collection standards and guidelines for determining setbacks and ecological buffers.
City of London Tree Preservation By-law C.P.-1555-252 (2021b)	• Regulates harm or destruction of trees within the Urban Growth Boundary • Outlines Tree Protection Areas • Amended by C.P—1555(b) – 29 on December 21, 2021	• The by-law regulates the injuring and destruction of trees on private property within the City of London that meet either of the following criteria: 1) Trees that have a trunk diameter of 50cm or greater measured 1.4m above Natural Ground Level, within the Urban Growth Boundary

Policy/Legislation/Plan	Description	Project Relevance
		2) Trees of any size within a Tree Protection Area (as shown in Schedule B of the Tree Protection By-law),
Middlesex Natural Heritage Systems Study (UTRCA 2014)	• The study provides a landscape level assessment of natural heritage features and functions. • The study incorporates the most current information available from the MNRF to identify areas that meet components of the PPS definition of significant. The methodology is intended to be a local approach to identifying elements of the natural heritage system.	• Figure 20 of the Study indicates that the treed areas along Fekete Drain and the woodland along the north of the subject lands are significant.
Ontario Regulation 41/24: Prohibited Activities, Exemptions and Permits	• This Minister's regulation replaced Ontario Regulation 157/06 (and all other individual conservation authority regulations) as of April 1, 2024. • O. Reg. 41/24 identifies constraints associated with wetlands, watercourses, and shorelines within the Upper Thames River Conservation Authority (UTRCA) jurisdiction.	• Regulated areas are present within the study area including wetlands and Fekete Drain. • Development, alteration, or interference with wetlands is prohibited within 30m of a wetland and 15m of a watercourse, subject to approval by the UTRCA. • The UTRCA may grant permission of development within regulated areas should it be shown that no impact will occur. An application for submission must be submitted to the UTRCA prior to any approval for development within these regulated areas.
Aquatic Habitat Assessment of Fekete Drain Memo (BioLogic 2019)	• Memo report summarizing the aquatic habitat assessments on the Fekete Drain.	• Utilized to determine aquatic assessment locations.

1.2 Project Scope

This EIS was scoped according to discussions with the City of London and the UTRCA during a virtual scoping meeting held on November 13, 2024 and per the Initial Proposal Report (IPR) comments received in September 2024. As this project has been on-going since 2021, several meetings, material submissions, and correspondences have occurred to discuss the project and scope. A general summary of the project scope history is provided in Table 2. The final scoping checklist and agency correspondence are provided in **Error! Reference source not found.**.

Table 2. Project Scope History

Item	Date
Site visit with Shane Butnari – City of London	May 10, 2022
First submission of Environmental Study Scoping Checklist (ESSC)	May 16, 2022
First scoping meeting with City of London and UTRCA	June 7, 2022
Site visit with City of London and UTRCA to delineate woodland and wetland boundaries	June 21, 2022
IPR comments	September 2024
Submission of Subject Land Status Report (SLSR)	November 8, 2024
Second scoping meeting with City of London and UTRCA to discuss ESA boundary and Geomorphic Study requirements	November 13, 2024
City of London Ecology comments on SLSR and second scoping meeting discussions.	December 3, 2024
Final submission of ESSC	March 7, 2025

2.0 Physical Environment

2.1 Soils, Terrain, and Drainage

The subject lands lie within the Upper Thames River watershed, which falls under the jurisdiction of the UTRCA through Ontario Regulation 41/24. The Upper Thames watershed is 3,420 km^2 and includes 28 subwatersheds (UTRCA 2017). The Dorchester Corridor subwatershed, where the study area is located, contains many significant groundwater recharge areas and highly vulnerable aquifers, as identified within the UTRCA Watershed Report Card (2017).

The overall topography of the subject lands is relatively flat, with a gradual decline toward the Fekete Drain. Existing surface water flows northwest towards the Thames River. As described in the Soils of Middlesex County (Hagerty and Kingston 1992), and confirmed by soil auger samples taken on site, the soil within the subject lands is generally described as very fine sandy loam that is well to imperfectly drained. Soil profiles that were examined by NRSI biologists noted the effective soil within the upland to be sandy loam underlain by silty loam.

NRSI identified 4 wetland units within the subject lands, with additional wetlands present within the study area. Soil probes that were taken from various locations within the wetlands indicated a shallow depth of loam over an effective layer of poorly drained silty loam. Soil mottling was evident in the upper 30cm of the soil profile, which is a characteristic used to aid in the delineation of the wetland boundaries. All 4 wetlands are palustrine and associated with the watercourse or headwater drainage features leading to the watercourse.

Fekete Drain is a permanent watercourse that flows towards the northwest through the subject lands. Fekete Drain originates as headwaters approximately 2km upstream of Hamilton Road, and it connects to the Thames River South Branch approximately 1km downstream from the subject lands. An unnamed tributary flow into Fekete Drain along the northern edge of the subject lands, located within the woodland. The tributary originates from drainage in the agricultural field just east of Veterans Memorial Parkway (Map 2).

As part of determining the limit of development within the subject lands, Development Engineering updated the regional 250-year floodline part of the current planning submissions to support Draft Plan / Rezoning applications. The erosion hazard limits were determined by Stonecairn Consulting with inputs from Momentum Earth Science. The updated flood line was

used to provide a technical justification for necessary roadway crossing structures to suitably convey the regional 250-year storm event.

2.2 Hydrogeology

A hydrogeological assessment of the subject lands was undertaken by Stonecairn Consulting (2025). The hydrogeological assessment involved the drilling of nine boreholes across the site and installation of three monitoring wells within the three boreholes to sample and test groundwater quality and elevation. Additionally, in March 2025, two piezometers were installed within the Fekete Drain south of the woodland to confirm shallow groundwater and surface water levels in this area. Refer to the Geotechnical Investigation and Hydrogeological Assessment for complete methodologies (Stonecairn Consulting 2025). The boreholes generally revealed a layer of surficial topsoil which is underlain by interlayered deposits of sand and silt till. Shallow groundwater is present in the near-surface sandy soils, perched above the less permeable silt till, with stabilized water levels measured between ground level to 3.46m below the existing ground surface.

The deepest groundwater levels were noted in the southwestern portion of the subject lands (Borehole BH3 located in the Cultural Woodland, CUW), while the shallowest groundwater levels were noted in the north where the narrow MAM2 connects to the FOD3-1 community (BH9) and south of the woodland along the Fekete Drain (BH1). Groundwater elevations in the monitoring wells were cyclical and showed seasonal variation, with seasonal high elevations generally observed in the spring (Stonecairn 2025).

2.3 Designated Natural Areas

Information on designated natural areas (ANSI's, ESA's, etc.), was obtained from the UTRCA, NHIC (MNRF 2022), the London Plan (City of London 2020), and the Natural Heritage Systems Study (UTRCA 2014). The Meadowlily Woods ESA is situated along the south side of the Thames River, encompassing a large portion of the property. The mapped ESA is located north of the subject lands, immediately north of the unnamed tributary. The boundary of the ESA was revised through the SLSR, as discussed in Section 5.4.

Significant Valleyland is identified within the London Plan along Fekete Drain.

Wetland features within the subject lands are identified as ‘Unevaluated Wetland’ in The London Plan (2020), and are unmapped according to the Land Information Ontario database. These features are shown on Map 1.

3.0 Natural Environment – Background Information

3.1 Collection and Review of Background Information

Existing natural heritage information was collected and reviewed in 2021 in order to determine a study approach for the SLSR. This information was used to identify key natural heritage features, habitats and species that are reported from, or have the potential to occur within the study area. The species lists were updated in 2024 to ensure that any new species records have been captured within the EIS.

The following background information sources were reviewed:

- City of London Official Plan (2023);
- Land Information Ontario (LIO) data base mapping;
- Natural Heritage Information Centre (NHIC) (MNRF 2024a);
- Ontario Breeding Bird Atlas (BSC et al. 2006);
- Ontario Reptile and Amphibian Atlas (Ontario Nature 2019);
- Atlas of the Mammals of Ontario (Dobbyn 1994);
- Ontario Butterfly Atlas (Macnaughton et al. 2024)
- Ontario Odonata Atlas (Ontario Odonata Atlas Database 2024);
- Aquatic Species at Risk Mapping (DFO 2024);
- Middlesex Natural Heritage System Study (UTRCA 2014); and,
- Aquatic Resources Area Data (Government of Canada 2022),

Species lists were compiled to provide information on species reported from within the vicinity of the study area based on data available from the wildlife atlases listed above. These atlases provide data based on 10x10km survey squares. Information on species from the survey squares that overlap with the study area (17MH85) were compiled.

3.2 Significant Species and Habitat Screening

Based on the initial species lists obtained through the background review in 2021, Species at Risk (SAR) and Species of Conservation Concern (SCC) were identified from the study area. This screening was updated using the species lists in 2024. SAR are those listed on the Species at Risk in Ontario List (MECP 2024) and/or the federal Species at Risk list (Government of Canada 2024). These include species identified by the Committee on the Status of Species at Risk in Ontario (COSSARO) as provincially Endangered, Threatened, or Special Concern. Species listed as Endangered or Threatened, and their habitat are protected

under the *Endangered Species Act* (2007) provincially, and aquatic species listed as Endangered or Threatened, and their habitat are protected under the *Species at Risk Act* (2007) federally. Federally listed migratory birds and their residences (i.e. nests) are also afforded protection under the Species at Risk Act. These are referred to in this report as 'regulated SAR'.

Species considered Special Concern are included in the definition of Species of Conservation Concern (SCC), which includes the following:

- species designated provincially as Special Concern;
- species that have been assigned a conservation status (S-Rank) of S1 to S3 or SH by the Natural Heritage Information Centre (MNRF 2024a); and
- species that are designated federally as Threatened or Endangered by the Committee for the Status of Endangered Wildlife in Canada (COSEWIC) but not provincially by the COSSARO. These species may be protected by the federal *Species at Risk Act* (SARA) if they are listed as Threatened or Endangered on Schedule 1 of the SARA, but are not protected provincially by the Endangered Species Act.

Habitat for terrestrial SCC may be considered Significant Wildlife Habitat (SWH) (OMNR 2010), which is afforded protection under the Provincial Planning Statement (PPS) (OMMAH 2024) and municipal natural heritage protection policies. Habitat for aquatic SCC is afforded protection under the fish habitat provision of the PPS and the federal *Fisheries Act*. According to the MNRF guidelines, to inventory a site for the identified special concern or rare species, studies need to be completed during the time of year when the species is present or easily identifiable, and for SCC habitat to qualify as SWH it needs to be easily mapped and cover an important life stage component for the species (e.g., specific nesting habitat, foraging habitat, etc.) (MNRF 2015).

A preliminary screening exercise was conducted in 2021 on these species to identify which species have suitable habitat within the subject lands and the study area, and was provided as part of the scoping package to the City and UTRCA. This screening was refined based on the field investigations. This involved cross-referencing the preferred habitat for reported SAR and SCC (OMNR 2000) against habitats known to occur on the subject lands or adjacent lands. This was completed to ensure that the potential presence of all SAR and SCC within the subject

lands was adequately considered in this EIS. This screening was updated in 2024 to ensure that species designations were correct (e.g. Barn Swallow (*Hirundo rustica*) was downlisted provincially).

Of the SAR and SCC that were identified as having records within the study area and surrounding 10km, numerous species were flagged during the preliminary screening as potentially having suitable habitat within the study area. The field surveys conducted in 2021 were designed to identify if potential regulated SAR or SCC and their habitats were present within the subject lands. The final significant species screening, updated based on the results of field surveys, is provided in Appendix II.

A screening exercise was also conducted to determine the presence of any SWH types within the study area. The Significant Wildlife Habitat Technical Guide (SWHTG) outlines the types of habitats that the MNRF considers significant in Ontario, as well as criteria to identify these habitats for Ecoregion 7E, in which the study area is located (OMNR 2000, MNRF 2015). The SWHTG groups SWH into four broad categories: seasonal concentration areas, rare vegetation communities and specialized wildlife habitat, habitats of SCC, and animal movement corridors.

Based on the results of the screening exercise, several candidate SWH types were identified as occurring, or having the potential to occur within the study area. Field surveys assessing the presence of the potential SWH types were completed and the results are summarized in the sections below. The final SWH screening updated based on the results of field surveys is provided in Appendix III.

3.3 Field Methods

Surveys conducted were undertaken in accordance with provincial and local guidance documents as indicated below. A total of nine site visits were completed between May and September 2021, with an additional three visits in 2022. Table 3 summarizes the field site investigations completed for the subject lands.

Table 3. Field Investigations Completed Within the Subject Lands and Study Area

Survey Type	Date (2021)*	Time	Weather Conditions				Staff
			Air Temp. (°C)	Precipitation	Cloud Cover (%)	Wind (Beaufort Scale)	
Terrestrial Field Surveys							
Vegetation Inventories and Ecological Land Classification	May 20	10:15 – 16:30	20	None	20	2	K. Richter, T. Sieg
	July 29	10:00 – 14:15	21	Intermittent	25	2	P. Deacon, K. Higgins
	September 19	10:00 – 13:15	16	None	0	0	P. Deacon, H. Manoharan
Woodland Dripline/ Wetland Delineation	September 19	10:00 – 13:15	16	None	0	0	P. Deacon, H. Manoharan
Woodland and Wetland Delineation with Agency Staff (UTRCA & City of London)	May 10, 2022	13:00 – 14:15	--	None	--	--	P. Deacon
	June 21, 2022	13:00 – 16:15	--	None	--	--	P. Deacon, G. MacVeigh
Migratory Bird Survey	May 19	06:47 – 07:20	10	None	5	1	I. Apkarian
Breeding Bird Survey	June 8	08:16 – 09:45	24	None	80	1	T. Brenton
	June 23	09:00 – 11:00	22	None	10	2	M.E. Gosnell, E. Gosnell
Snake Surveys	June 8	08:16-09:45	24	None	80	1	T. Brenton
	June 10	19:30 – 20:30	20	None	50	2	N. Allen
	June 23	09:00 – 10:45	22	None	10	3	M.E. Gosnell, E. Gosnell
	July 29	10:00 – 12:30	21	Intermittent prior to survey	25	2	P. Deacon, K. Higgins
Anuran Call Surveys	May 19	21:35 – 21:55	26	None	70	4	B. Baldwin
	June 10	20:50 – 21:10	19	None	60	2	N. Allen

Survey Type	Date (2021)*	Time	Weather Conditions				Staff
			Air Temp. (ºC)	Precipitation	Cloud Cover (%)	Wind (Beaufort Scale)	
	April 12, 2022	20:35 – 21:10	18	None	20	2-3	B. Baldwin
Odonata and Lepidoptera Surveys	May 20	10:15 – 16:30	20	None	20	2	K. Richter, T. Sieg
	July 29	10:00 – 12:30	21	Intermittent prior to survey	25	2	P. Deacon, K. Higgins
Bat Cavity Tree Assessments	May 20	10:15 – 16:30	20	None	20	2	K. Richter, T. Sieg
Aquatic Field Surveys							
Benthic Macroinvertebrate Survey	October 28	10:00 – 12:30	8	None	75	3	B. Baldwin, S. Henderson
Thermal monitoring of Fekete Drain	Deployed May 19	13:00	26	None	100	3	B. Baldwin
	Retrieved October 28	12:30	8	None	75	3	B. Baldwin, S. Henderson
Aquatic Habitat Assessment	May 19	18:00 – 20:00	26	None	70	0	B. Baldwin
Fish Community Survey	September 2	10:00 – 12:30	20	None	40	0	B. Baldwin; S. Catry

*All surveys completed in 2021, unless otherwise noted.

3.4 Terrestrial Habitat and Species

3.4.1 Vegetation Surveys and Ecological Land Classification Mapping

Vegetation community delineation was completed using aerial photography prior to field verification on May 20, 2021. Communities were subsequently refined during detailed seasonal vascular plant inventories and are shown on Map 2. The standard Ecological Land Classification (ELC) System for southern Ontario was applied (Lee et al. 1998). Details of vegetation communities were recorded including species composition, dominance, uncommon species or features, and evidence of human impact.

All observed species of vascular flora were recorded during field surveys on May 20, July 29, and September 19, 2021. These surveys correspond to spring, summer, and fall-based botanical inventories.

3.4.2 Woodland Dripline/ Wetland Delineation

NRSI biologists delineated and surveyed the tree dripline using a SXBlue II GNSS GPS unit with sub-meter accuracy, in order to accurately delineate the woodland boundary. This survey was completed on September 19, 2021.

A site visit with agency staff was conducted on May 10 and June 21, 2022 to verify woodland and wetland boundaries. The wetland boundary was surveyed June 21, 2022.

3.4.3 Migratory Bird Survey

A single migratory bird survey was conducted on May 19, 2021 to document use of the subject lands by migratory birds. The survey included area searches throughout the subject lands to document species and the total number observed. The survey route is shown on Map 3.

3.4.4 Breeding Bird Surveys

Breeding bird surveys were completed on June 8 and July 23, 2021. Surveys methods primarily followed the Ontario Breeding Bird Atlas protocol (OBBA 2021a, OBBA 2021b), with modifications from the Forest Bird Monitoring Program (Cadman et al. 1998). This modified approach allowed for improved field data collection by tailoring survey methods to the specific conditions and requirements of the study area. The breeding bird surveys consisted of area searches located throughout the subject lands and occurred in the early morning beginning no earlier than 30 minutes prior to sunrise and extending to four hours after sunrise. All birds

observed, as well as the highest level of breeding evidence exhibited for each species, were recorded by an avian biologist. The survey route is shown on Map 3.

3.4.5 Snake Surveys

Cover board surveys and active searches for snakes were undertaken to identify snake species present within the subject lands. A Wildlife Scientific Collectors Authorization was obtained from the MNRF, Aylmer district office (Permit #109756) in order to undertake these surveys.

A total of 5 snake cover boards were placed within the subject lands on May 19, 2021 and are shown on Map 3. Each board measured 4ft x 4ft, with the upper surface painted black to absorb heat. Boards were checked a total of 4 times between June 8 and July 28, 2021 for the presence of snakes. When checking boards, biologists lifted each board slowly to check for snakes underneath, taking care to replace the board to its original position. All snake species, number of individuals, approximate length, and behaviour were recorded.

3.4.6 Anuran Call Surveys

Evening anuran (frog and toad) call surveys were conducted on May 19 and June 10, 2021, and on April 12, 2022 according to the Marsh Monitoring Program protocol (BSC 2009) at 3 stations (Map 3). The May 2021 survey was conducted in the second half of the month due to air temperatures and weather conditions not being conducive to the monitoring program protocol earlier. Monitoring focused on calling frogs and toads during 3-minute surveys, which included call intensity and an estimated number of individuals. Additional information, including survey time, air and water temperature, wind speed, and cloud cover were recorded at each survey station.

3.4.7 Odonata and Lepidoptera Surveys

Targeted area searches for Odonata (dragonflies and damselflies) and Lepidoptera (butterflies) were conducted on two dates during the spring and summer of 2021. All data including species observed, numbers, and weather conditions were recorded on a standardized area search data form.

3.4.8 Bat Cavity Tree Assessment

An inventory of cavity trees that may provide suitable habitat for bats was conducted on May 20, 2021 in areas where there was potential for tree removal. This was completed when canopy cover was still light enough in order to determine if the trees had crevices or exfoliating bark.

The assessment was focused on the cultural woodland in the southwest corner of the subject lands and the hedgerow of trees in the southeast corner.

3.4.9 Additional Wildlife

During all site visits, wildlife habitat was assessed within the subject lands with an emphasis on any features that could be indicative of SWH or habitat for SAR. Any potentially significant habitats were documented, photographed, and georeferenced using a hand-held GPS unit. Any incidental observations (i.e. tracks, scat, etc.) of wildlife were also recorded during all site visits including observations of mammals, herpteofauna, birds butterflies and odonates.

3.5 Aquatic Resources

3.5.1 Aquatic Habitat Assessment and Temperature Monitoring

Aquatic habitat assessments were conducted on May 19, 2021 within Fekete Drain where present within the subject lands and adjacent areas, and the tributary located just north of the subject lands (Map 4). The following information was recorded for each aquatic habitat segment within the subject lands, where possible:

- substrate type;
- channel depth, width, etc.;
- water temperature;
- dissolved oxygen;
- bank stability;
- aquatic vegetation cover; and
- critical life stage areas (i.e. spawning, nursery habitat, etc.).

In addition to the habitat assessments, temperature monitoring within the Fekete Drain was performed to further characterize the aquatic conditions within the study area and assist in the determination of sensitivity and potential habitat suitability for aquatic species. Air temperature measurements were taken as well. Surface water temperature and air temperature monitoring was completed through the instillation of continuous temperature data loggers at 5 locations between May 19 and October 28, 2021. The air temperature logger was installed beside the Fekete Drain on a tree. Following the removal of temperature loggers on October 28, 2021, the air and water temperature data was compared to precipitation levels recorded by Environment and Climate Change Canada monitoring station 6144478 within the City of London, in order to determine trends in surface water temperatures within the study area.

3.5.2 Fish Community Sampling

Fish community sampling was conducted on September 2, 2021 by a two-person crew using a Smith-Root LR-20B Electrofishing unit and dip nets to capture fish present following the single-pass screening level assessment based on the Ontario Stream Assessment Protocol at 5 sampling stations shown on Map 4 (Stanfield 2017). Sampling generally followed the same habitat reaches within the extent of the drain present to fully assess the fish community. No electrofishing was completed within the Unnamed Tributary as no water was present to support fish. All fish collected were identified, enumerated, and released live shortly after capture.

The fish community survey was undertaken under a *License to Collect Fish for Scientific Purposes*, as obtained from the MNRF, Aylmer District Office, on June 15, 2021 (Permit #1098542).

Electrofishing conditions from the September 2, 2021 survey are provided in Table 3.

Table 4. Electrofishing Conditions

	EMS-001	EMS-002	EMS-003	EMS-004	EMS-005
Sampling start time (hrs)	10:15	10:40	11:00	11:25	12:10
Sampling end time (hrs)	10:35	11:00	11:20	12:10	12:30
Air temperature (°C)	22	21			
Water temperature (°C)	18				
Voltage (V)	150	150	200	200	150
Pulsating Frequency (Hz)	90				
Shocking time (sec)	239	207	239	405	405

3.5.3 Benthic Invertebrate Survey/Monitoring

Benthic macro-invertebrate surveys were carried out October 28, 2021 to assess the general health of the aquatic habitats within the study area using the benthos as indicators of water quality. Three benthic macro-invertebrate monitoring stations (as shown on Map 4) were assessed following the standard Ontario Benthos Biomonitoring Network (OBBN) sampling protocol (Jones et al. 2007). Stations were established at the same locations assessed by BioLogic (2019) to further characterize the environmental water quality and provide a baseline for future monitoring. Sampling station BTH-001 is located within the lower reaches of Fekete Drain upstream of the Tributary, within habitat assessment reach AHP-003.

Sampling station BTH-002 is located downstream of Hamilton Road and is approximately analogous with the BioLogic's (2019) Station 2. BTH-003 is located south of the study area,

and upstream of the Hamilton Road Stormwater Management Pond outlet, and is approximately analogous with the BioLogic's (2019) Station 1.

Each monitoring station was comprised of 3 sub-stations: 2 from riffle habitat and 1 from pool habitat, to allow for qualitative sampling of benthic macro-invertebrate communities. Each sub-station was assessed following the OBBN "Traveling Transect Kick and Sweep" method, where each subsample was comprised of a 10m linear sampling transect sampled over a 30-minute period. Resulting samples were preserved in a buffered 70% ethanol solution for identification in NRSI's benthic invertebrate laboratory.

3.5.3.1 Benthic Invertebrate Data Analysis

Benthic samples were processed and analyzed in NRSI's laboratory. Samples were sub-sampled using the weight-based sub-sampling procedure described by Sebastien et al. (1988) to accurately represent the makeup of the benthic community. Sub-samples were sorted using a dissection microscope to collect all invertebrate individuals within the sub-sample. All benthic invertebrates within the sample were enumerated. Using both compound and dissecting microscopes, the samples were identified to the lowest taxonomic level practical. A total of 12 metrics and indices were calculated to assess the benthic invertebrate community for each reach. These metrics and indices included:

- Taxa Richness – the number of taxa generally increases with habitat diversity and water quality (Jones et al. 2007).
- Ephemeroptera, Plecoptera, Tricoptera (EPT) Taxa Richness – the number of taxa from orders sensitive to pollution, specifically the orders Ephemeroptera, Plecoptera, and Tricoptera (Barbour et al. 1999; Weber 1973).
- Percent EPT – percent composition of a community by taxa from orders sensitive to pollution, specifically the orders Ephemeroptera, Plecoptera, and Tricoptera (Barbour et al. 1999; Weber 1973).
- Percent Oligochaetes – % composition of a community of aquatic worms, a group tolerant to pollutants (Jones et al. 2007).
- Percent Diptera – % composition of a community of fly larvae which provides a context for other analysis (Jones et al. 2007).

- Percent Chironomidae – % composition of a community of larval midges, a highly tolerant family, the family Chironomidae is a highly tolerant portion of the Order Diptera (Jones et al. 2007).
- Shannon-Wiener Index (H') – an index used to measure the diversity in categorical data, taking into account the number of species and evenness of the species.
- Simpson's Diversity Index (D) – a measure that takes into account the abundance patterns and taxonomic richness of the benthic community. The formula determines the proportion of individuals of each taxonomic group at a station that contribute to the total number of individuals at that station (Simpson 1949).
- Hilsenhoff Biotic Index (BI) – a measure of water quality based on the species-level "tolerance values", the number of individuals of each species and the total number of individuals within the sample.
- Family Biotic Index (FBI) – a measure of water quality based on the family-level "tolerance values" and the number of individuals within each family and the total number of individuals within the sample (Hilsenhoff 1988).
- Dominant/Subdominant Taxa – highest and second highest number of species by taxa sampled.
- Percent Functional Feeding Groups – the percent composition of a community by Collector-Filterers, Collector-Gatherers, Predators, Scrapers, and Shredders. Feeding groups can provide an indication of habitat conditions (Merritt et al. 2008).

The results of these metrics were then compared to a set range of 'Potentially Unimpaired' conditions and 'Potentially Impaired' conditions. The OBBN defines impaired as, "showing a biological response to imposed stressors; exhibiting a changed biological community brought about by degradation in water or habitat quality" (Jones et al. 2007). 'Potentially Unimpaired' conditions indicate a low probability of significant anthropogenic impact, and 'Potentially Impaired' conditions indicate a high probability of significant anthropogenic impact within an aquatic environment. These ranges can be used as measures of the environmental water quality and serve as potential indicators of ongoing environmental impacts. They also provide added context for the results of the benthic assessment. The ranges are based on the results of benthic rapid assessment methodologies developed by the MNRF, MECP, the Ministry of Municipal Affairs and Housing (MMAH), and the Toronto and Region Conservation Authority (TRCA). Table 3 provides the range of results that can be attributed to the 'Potentially Unimpaired' and 'Potentially Impaired' categories within an ecosystem (Vannote et al. 1980).

Table 5. General Benthic Invertebrate Assessment Ranges

Water Quality Index	Potentially Unimpaired	Potentially Impaired	Source
Taxa Richness	>13	<13	David et al. 1998
EPT Richness	>10	<10	David et al. 1998 and Kilgour 2000
% EPT	>10	>10	David et al. 1998 and Kilgour 2000
% Oligochaetes	<10%	>10%	David et al. 1998 and Griffiths 1998
% Diptera	20-45%	<20 or >50%	David et al. 1998
% Chironomidae	<10%	>10%	Griffiths 1998
Shannon-Wiener Index	1.5-3.5	<1.5 or >3.5	MacDonald 2003
Hilsonhoff Biotic Index	<7	>7	Kilgour 1998
Family Biotic Index	<6	>6	Kilgour 1998

4.0 Natural Environment - Results and Discussion

4.1 Terrestrial Species and Habitat

4.1.1 Vegetation Communities

The subject lands consist of cultural meadow, forest (including a naturalized plantation), and wetland. The Cultural Plantation within the subject lands used to extend out into the majority of the lands, but clearing had occurred within the spring of 2016. A summary of ELC communities identified within the study area is provided in Table 4. ELC communities are described in the table and shown on Map 2, including the surveyed dripline and wetland boundaries. ELC field forms have been provided in Appendix IV.

Table 6. Vegetation Communities Identified within the Study Area

ELC Ecosite Type	ELC Description	Environmental Characteristics
Cultural		
CUM	Cultural Meadow	The cultural meadow comprises a large portion of the proposed development area. The meadow surrounds the former homestead, and is also present along the western subject lands boundary. All buildings have been removed from the subject lands. The meadow is dominated by non-native cool season grasses, along with abundant Tall Goldenrod (*Solidago altissima*) and Queen Anne's Lace (*Daucus carota*). Adjacent to the location of the former homestead, the hedgerow to the west is comprised entirely of White Pine (*Pinus strobus*), and the eastern hedgerow is comprised entirely of Norway Spruce (*Picea abies*). A few isolated landscape trees are present within the overgrown lawn to the south of the former homestead site.
CUS	Cultural Savannah	The cultural savannah is dominated by mature Eastern Cottonwood (*Populus deltoides*). Manitoba Maple (*Acer negundo*) are found occasionally in the subcanopy. Due to the discontinuous canopy, the groundcover is a meadow, dominated by non-native cool season grasses with an abundance of forbs, including Dame's Rocket (*Hesperis matronalis*), Goldenrods (*Solidago* spp,), and patches of European Common Reed (*Phragmites australis* ssp. *australis*). Grey Dogwood (*Cornus racemosa*) and Glossy Buckthorn (*Frangula alnus*) are occasional in the understorey.
CUW	Cultural Woodland	This small woodland, located at the southwest corner of the subject lands is dominated by Manitoba Maple, with occasional Eastern Cottonwood. Similar to the cultural savannah, the canopy is fairly open, allowing a meadow to flourish in the ground layer. The meadow is dominated by grasses with a variety of forbs, including Dame's Rocket, Asters (*Symphyotrichum* spp.), and Goldenrods. Staghorn Sumac (*Rhus typhina*) is abundant in the understorey.
Wetland		
MAM2	Mineral Meadow Marsh Ecosite	All four of the meadow marsh features are dominated by wetland forbs and graminoids such as Dark Green Bulrush (*Scirpus*

ELC Ecosite Type	ELC Description	Environmental Characteristics
		atrovirens), Swamp Milkweed (*Asclepias incarnata*), Blue Vervain (*Verbena hastata*), and several Rush species (*Juncus* spp.). These areas are low-lying in comparison to the surrounding meadow community but do not hold standing water for a prolonged period in the spring. Three of the marshes direct surface water toward Fekete Drain, while fourth is isolated and holds some surface water. The hydrology of the marsh along Fekete Drain has been influenced by 2 Beaver dams at the south edge of the treed riparian area. Near the edge of the watercourse, a well-established stand of Lakebank Sedge (*Carex lacustris*) indicates the permanency of marsh in the area closer to the creek bank with the area further east comprised of a mixture of upland and wetland species.
SWT3	Organic Thicket Swamp Ecosite	The thicket swamps are inclusions within the forested communities to the north of the subject lands. The swamps have formed along topographic depressions, including the tributary to Fekete Drain. Near the centre of the features, the organic soils are deeper than 40cm. The community is dominated by Skunk Cabbage (*Symplocarpus foetidus*), with abundant Fowl Mannagrass (*Glyceria striata*), and associations of Sensitive Fern (*Onoclea sensibilis*), Sweet-scented Bedstraw (*Galium triflorum*), Field Horsetail (*Equisetum arvense*), and Spotted Jewelweed (*Impatiens capensis*) among other species. Trembling Aspen (*Populus tremuloides*) is found scattered in the canopy, along with few Eastern Cottonwood. European Buckthorn (*Rhamnus cathartica*) and Glossy Buckthorn are found occasionally in the understorey, along with a few Willow species (*Salix* sp.).
Forest		
CUP 3-2	White Pine Coniferous Plantation Type	The plantation in the northeast is dominated by White Pine, but is naturalizing with early establishment of hardwoods and native shrubs seeding-in from the forest communities to the north. Black Cherry (*Prunus serotina*) is found occasionally within the forest, along with a variety of other deciduous trees. The understory is comprised of Glossy Buckthorn and young White Ash (*Fraxinus americana*), both of which form a very dense stand along the southern edge of the feature. These two species are also abundant in the ground layer, along with a variety of forbs, such as Woodland Agrimony (*Agrimonia gryposepala*), Jack-in-the-pulpit (*Arisaema triphyllum*), and Enchanter's Nightshade (*Circaea canadensis*).
CUP 3-3	Scotch Pine Coniferous Plantation Type	The plantation along Fekete Drain and along the western portion of the woodland, has a similar species composition as the White Pine plantation, but is dominated by Scot's Pine (*Pinus sylvestris*) in the canopy. Somewhat more isolated from the forest communities to the north, hardwood recruitment is less evident here but some native tree and shrub species can be found among the overstocked and declining Scot's Pine.
FOD 3-1	Fresh Poplar Deciduous Forest Type	This community is dominated by Trembling Aspen, along with small amounts of mid-age Black Cherry, Sugar Maple (*Acer saccharum*), and Red Maple (*A. rubrum*). The sub-canopy is comprised of Sugar Maple and scattered Trembling Aspen. White

ELC Ecosite Type	ELC Description	Environmental Characteristics
		Ash dominates the understorey and groundcover, along with a variety of common forbs including Enchanter's Nightshade and White Avens (*Geum canadense*). The forested communities (FOD3-1 and FOD5-7) contain many trails that are used by hikers, mountain bikes, and ATVs.
FOD 5-7	Fresh Sugar Maple-Black Cheery Deciduous Forest Type	This forest is dominated by Sugar Maple and Black Cherry. All mature Ash trees are dead and include standing snags and deadfall. American Beech (*Fagus grandifolia*) and Hop Hornbeam (*Ostrya virginiana*) are also present. Given the separation between this community and the proposed development area, it was not assessed in detail.

4.1.2 Vascular Flora

A three-season vegetation inventory was conducted with a total of 188 species recorded by NRSI biologists. A complete list of these species is attached to this report (Appendix V). No federally or provincially significant plant species were observed within the subject lands.

A total of seven regionally significant plant species (Oldham 2017) were observed within the subject lands, as listed in Table 5.

Table 7. Regionally Significant Vascular Flora Observed in the Subject Lands

Common Name	Scientific Name	S-Rank[1]	COSSARO[2]/ COSEWIC[3]	County Status[4]	ELC Community
Drooping Sedge	*Carex prasina*	S4	-	R	SWT3
Evergreen Wood Fern	*Dryopteris intermedia*	S5	-	R	FOD3-1
Great Duckweed	*Spirodela polyrhiza*	S5	-	R	Fekete Drain
Jointed Rush	*Juncus articulatus*	S5	-	R	MAM2
Perennial Evening-primrose	*Oenothera perennis*	S5	-	R	CUM1
Tender Sedge	*Carex tenera*	S5	-	U	CUM1
Virginia Mountain-mint	*Pycnanthemum virginianum*	S4	-	R	CUM1

[1,3]MNRF 2022, [2]MECP 2022, [3]Government of Canada 2022, [4]Oldham 2017

S-Rank	Middlesex County Status
S5 Secure	U Uncommon
S4 Apparently secure	R Rare and native

4.1.3 Birds

In total, 92 species are reported from the vicinity of the study area based on the OBBA (BSC et al. 2008). A total of 49 species were documented within the study area during field surveys by NRSI biologists.

Breeding Birds

28 species observed within the study area displayed evidence of possible (15 species), probable (9 species), or confirmed breeding (4 species) within the study area. Most of the observed bird species are relatively common and have secure populations in Ontario. Of note, was confirmed breeding of Red-tailed Hawk (*Buteo jamaicensis*) within the CUP3-2 near the northeast edge of the subject lands.

Migratory Birds

A total of 35 species and an approximated count of 173 individuals were documented during the migratory bird survey. All species are common and typical of a forest and cultural meadow landscape. The survey documented 4 warbler species: Common Yellowthroat (*Geothlypis trichas*), Pine Warbler (*Setophaga pinus)*, Tennessee Warbler (*Leiothlypis peregrina*), and Yellow Warbler (*Setophaga petechia)*.

Refer to Appendix V for a list of bird species recorded within in the subject lands and vicinity.

Significant Bird Species

Bank Swallow

Bank Swallow (*Riparia riparia*) is listed as Threatened provincially, affording individuals and their habitat protection under the *Endangered Species Act*. Bank Swallows can be found along rivers and lakes where there are vertical faces for nesting (OMNR 2000). One Bank Swallow was observed foraging within the Fekete Drain corridor on June 23, 2021. There was no evidence of nesting within the subject lands. As no nests were documented, breeding habitat for this SAR is not present within the subject lands.

Barn Swallow

As of January 25, 2023, Barn Swallow (*Hirundo rustica*) has been provincially downlisted from Threatened to Special Concern. As a result, its nesting habitat is no longer regulated under the *Endangered Species Act*. Barn Swallows can be found in rural areas near bodies of water. They nest in buildings or other man-made structures (OMNR 2000). One Barn Swallow was

observed flying over the cultural meadow during the migratory bird survey on May 19, 2021. During the second breeding bird survey on June 23, Barn Swallows were also observed foraging over the cultural meadow and along the Fekete Drain corridor, including 2 fledged young. The observed Barn Swallows are presumed to be nesting in the barn located to the west of the subject lands, where multiple individuals were observed flying in and out. The subject lands do not contain nesting habitat for Barn Swallow.

Eastern Wood-pewee

Eastern Wood-pewee (*Contopus virensis*) listed as Special Concern and therefore its habitat is not regulated under the *Endangered Species Act*. The species is afforded protection under the Provincial Policy Statement as breeding habitat is considered SWH. For habitat they require mid-canopy layer of forest clearings and edges of deciduous and mixed forests, abundant in intermediate-age mature forest stands with little understory vegetation (OMNR 2000). Eastern Wood-pewee was documented within the interior area of the woodland (FOD3-1) during the migratory bird survey and the first breeding bird survey. One individual was documented singing during each of the surveys, and the interior woodland provides suitable habitat. Although nesting was not confirmed, SWH for this species is present within the interior forest, which likely supports at least one breeding pair.

Wood Thrush

Wood Thrush (*Hylocichla mustelina*) is listed as Special Concern provincially, and threatened federally. Therefore, its habitat is protected as SWH, but it is not protected by the *Endangered Species Act*. Wood Thrush can be found in undisturbed moist mature deciduous or mixed forest with deciduous sapling growth. They can be found in close proximity to ponds or swamps, and typically require trees greater than 12m in height within the woodland. Three Wood Thrush were heard during the migratory survey within the woodland north of the subject lands, but were not documented during the two breeding bird surveys. As no breeding evidence was observed, SWH has not been identified for this species.

4.1.4 Herpetofauna

According to the Ontario Reptile and Amphibian Atlas (Ontario Nature 2019), 23 species of herpetofauna are reported from within 10km of the subject lands. NRSI field investigations confirmed the presence of 6 species within the study area. A complete list of herpetofauna reported from the study area, based on background information and observations made as part

of this study, is included in Appendix V. The results of species-specific surveys are detailed in the following sections.

Anurans

Anuran call surveys were conducted to identify the presence of breeding frog and toad species within the subject lands. Table 6 presents the anuran call survey results.

Table 8. Anuran Call Survey Results

Station	Date	Call Abundance (Number of Individuals) *			
		Spring Peeper	Tetraploid Gray Treefrog	American Toad	Green Frog
ANR-001	April 12, 2022	2(6)	--	2(2)	--
	May 19, 2021	--	--	2(5)	2(4)
	June 10, 2021	--	--	--	--
ANR-002	April 12, 2022	--	--	--	--
	May 19, 2021	--	--	--	--
	June 10, 2021	--	--	--	--
ANR-003	April 12, 2022	2(4)	--	--	--
	May 19, 2021	--	--	2(4)	1(2)
	June 10, 2021	1(1)	2(5)	1(1)	1(1)

*Call abundance refers to the Marsh Monitoring Programs call codes (Bird Studies Canada 2009).

Evening anuran call surveys and incidental observations documented American Toad (*Anaxyrus americanus*), Gray Treefrog (*Hyla versicolor*), Northern Green Frog (*Lithobates clamitans melanota*), and Spring Peeper (*Pseudacris crucifer*). No anurans were heard at ANR-002. ANR-001 had 3 species heard throughout the surveys, and ANR-003 had 4 species heard. Northern Leopard Frog (*Lithobates pipiens*) was observed during the spring vegetation survey in the creek corridor, but was not recorded during call surveys. No significant anurans were observed from the subject lands.

Snakes

Only Eastern Gartersnake (*Thamnophis sirtalis sirtalis*) was observed within the subject lands during the field surveys. This species was observed under one snake board (SNK-02, located along the creek corridor), only one time, during snake coverboard surveys. Given the lack of snake observations during the site visits, it can be deduced that a snake hibernaculum is not present. No significant snake species were observed from the subject lands.

4.1.5 Mammals

According to the Mammal Atlas of Ontario (Dobbyn 1994), 46 mammal species are reported from within 10km of the subject lands. During the various field surveys, 8 of these species were observed. During the snake cover board surveys, Meadow Vole (*Microtus pennsylvanicus*) was observed under some of the boards. Additional mammal species documented within the subject lands included: Beaver (*Castor canadensis*), Coyote (*Canis latrans*), Eastern Cottontail (*Sylvilagus floridanus*), Eastern Chipmunk (*Tamias striatus*), Eastern Gray Squirrel (*Sciurus carolinensis*), Raccoon (*Procyon lotor*), and White-tailed Deer (*Odocoileus virginianus*). Appendix V provides a complete list of mammal species reported from the study area.

Bat Habitat

Six bat SAR, Little Brown Myotis (*Myotis lucifungus*), Northern Myotis (*Myotis septentrionalis*), Tri-colored Bat (*Perimyotis subflavus)*, Eastern Red Bat (*Lasiurus borealis*), Hoary Bat (*Lasiurus cinereus*) and Silver-haired Bat (*Lasionycteris noctivagans*) were screened as having potential to occur within the study area. Based on the assessment conducted by NRSI staff in 2021, no suitable habitat trees are located within the CUW or the hedgerows associated with the former residence. Following a conservative approach, the cultural plantations (CUP3-2 and CUP3-3) have been identified as candidate habitat for SAR bats.

4.1.6 Insects

Butterflies

According to the Ontario Butterfly Atlas (Macnaughton et al. 2022), 31 butterfly species are reported from the study area (Appendix V). NRSI biologists observed 9 butterfly species during surveys within the subject lands including Baltimore Checkerspot (*Euphydryas phaeton*), Cabbage White (*Pieris rapae*), Common Wood-Nymph (*Cercyonis pegala*), Eastern Tiger Swallowtail (*Papilio glaucus*), European Skipper (*Thymelicus lineola*), Inornate Ringlet (*Coenonympha tullia inornata*), Least Skipper (*Ancyloxypha numitor)*, Monarch (*Danaus plexippus*), and Mourning Cloak (*Nymphalis antipoa*). Butterfly observations were concentrated along forest and field edges and in areas of cultural meadow.

Monarch was the only significant butterfly species to be documented from the area during the field surveys. As many as 2 individuals were observed at one time within the CUM and CUS area. Common Milkweed (*Asclepias syriaca*) is found occasionally within the subject lands and a variety of nectar plants, both agricultural weeds as well as Asters and Goldenrods, are

present. Areas containing large amounts of Milkweed (*Asclepias spp.)* and nectaring plants are considered SWH. Based on the vegetation surveys and the low number of Monarch butterflies within suitable nectaring habitat, SWH for Monarch is not present within the subject lands.

Odonata

Information obtained from the Ontario Odonata Atlas Database (OOAD 2022) indicates that 54 species of dragonflies and damselflies are reported from the study area vicinity. During field surveys, NRSI biologists documented 4 species from the subject lands: Common Whitetail (*Plathemis lydia*), Double-striped Bluet (*Enallagma basidens*), Eastern Forktail (*Ischnura verticalis*), and Ebony Jewelwing (*Calopteryx maculata*). Most of the odonata observations were noted in areas of cultural meadow and wetland pockets. A complete list of odonata species observed and reported from the study area and vicinity is provided in Appendix V. No significant Odonates were observed from the subject lands.

4.1.7 Additional Wildlife

During the 2021 surveys, two Terrestrial Crayfish chimneys were observed in the vicinity of the Fekete Drain corridor, within the northern end of the meadow marsh community that formed as a result of the Beaver dam. During the June 2022 site visit, an additional three chimneys were observed in the meadow marsh at the northern end of the meadow, adjacent to the conifer plantations (Map 3).

4.2 Aquatic Resources

4.2.1 Aquatic Habitat

Fekete Drain

The primary watercourse within the subject lands is the Fekete Drain. This permanent watercourse is approximately 500m long within the subject lands, flowing northwest to the Thames River South Branch, approximately 1km downstream of the subject lands. Fekete Drain is considered a Class C municipal drain. Class C drains are characterized by permanent flow with potential spring spawning habitat and no sensitive freshwater fish species (Kavanagh et al. 2018). Four reaches were assessed within Fekete Drain, two within the subject lands, one upstream (south) of Hamilton Road, and one downstream (north) of the subject lands. These reaches are shown on Map 4. Water parameter measurements were taken within the four reaches during the assessment on May 19, 2021 and are provided in Table 7 below. Water

temperatures decreased within Fekete Drain from the upstream reach to the furthest downstream reach assessed.

Table 9. Water Parameter Measurements in Fekete Drain

Reach	Time Taken (hrs)	Air Temp (ºC)	Water Temp (ºC)	Conductivity (mS/m)	TDS (ppt)	pH
Reach 1 (AHP-001)	18:00	26	17	0.85	0.9	6.79
Reach 2 (AHP-003)	19:00	26	19	0.87	0.9	7.2
Reach 3 (AHP-004)	19:30	26	19	0.87	0.9	7.2
Reach 4 (AHP-005)	20:00	26	21	0.87	0.9	6.9

Reach AHP-001

At the downstream most extent of Reach AHP-001, Fekete Drain is characterized as a relatively shallow, straight channel (0.05 - 0.15m depth) with wetted widths ranging from 0.5 to 1.5m. This reach is immediately downstream of the confluence with the Unnamed Tributary to Fekete Drain. Bankfull widths ranged from 3.0 to 4.0m, with bankfull depths ranging between 0.3 and 0.5m. No instream vegetation was observed, and there were sparse patches of filamentous algae throughout. Substrates within this reach were observed to be predominantly silt and sand with deposits of detritus and traces of gravel. The channel in this reach is an entrenched drain, flowing along the edge of the thicket and cultural savannah communities. Banks were observed to be steeply sloped (ranging from 90° to 125°) with evidence of ongoing erosion and undercutting that suggest periodic high flow conditions. Bank vegetation was observed to be sparse, consisting primarily of patches of terrestrial grasses and exposed roots. Traces of iron staining along the exposed banks suggest shallow groundwater upwelling throughout the vicinity of Fekete Drain.

Reach AHP-003

Reach AHP-003 extends south from the confluence of the Unnamed Tributary to the Beaver dams (Map 4), immediately upstream of Reach AHP-001. This reach is characterized as a relatively shallow straight channel (0.05 - 0.15m deep) with wetted widths ranging from 0.4 to 2.5m. Bankfull widths ranged from 3.0 to 7.0m, with bankfull depths ranging between 0.5 to 0.75m. Pockets of Broad-leaved Cattail (Typha latifolia) and sparse patches of filamentous

algae were observed throughout the reach. Substrates were predominantly silt, sand, and gravel with deposits of detritus and traces of cobble. This reach is an entrenched channelized drain within the coniferous plantation. The creek banks were observed to be steeply sloped (ranging from 90° to 125°) with evidence of ongoing erosion and undercutting, as well as rills suggesting periodic high flows. Bank vegetation was observed to be sparse, consisting primarily of patches of terrestrial grasses and exposed roots. Traces of iron staining along the exposed banks suggest shallow groundwater upwelling throughout this reach.

Reach AHP-004

Reach AHP-004 extends north from Hamilton Road to the Beaver dams, flowing through a small wetland. Reach AHP-004 of Fekete Drain is characterized as a moderately deep, slow flowing, poorly defined channel (0.5 - 1.25m deep) with wetted widths ranging between 1.5 to 8.5m. Bankfull widths ranged from 2.0 to 10.0m, with bankfull depths ranging between 1.0 and 2.0m. Dense patches of Broad-leaved Cattail and Common Reed (*Phragmites australis*) were observed along the edges of Fekete Drain. Substrates within this reach were observed to be predominantly sand, with deposits of detritus and silt. The channel was observed to be poorly defined, with back flooding due to the Beaver dams.

Reach AHP-005

Located upstream of the subject lands, Reach AHP-005 extends south from Hamilton Road approximately 90m, alongside a stormwater management pond. Reach AHP-005 is characterized as a channelized, moderately shallow meandering, poorly defined channel (0.5 - 0.75m deep) with wetted widths ranging from 1.5 to 3.5m. Bankfull widths ranged from 2.5 to 5.4m, with bankfull depths ranging from 1.0 to 2.0m. Dense patches of Broad-leaved Cattail and Common Reed were observed along the edges of Fekete Drain. Substrates within this reach were predominantly sand, with deposits of detritus and silt. Banks were observed to be steeply sloped (ranging from 90° to 125°). Bank vegetation was observed to be very dense consisting primarily of terrestrial grasses and Common Reed.

Unnamed Tributary of Fekete Drain

This intermittent watercourse in classified as an F type drain. Class F drains are characterized by as having intermittent periods of flow with limited fish presence (Kavanagh et al. 2018). The tributary flows west, across the width of the study area, flowing into Fekete Drain approximately 370m downstream from Veterans Memorial Parkway. East of the road, the tributary is identified

as being a closed/tiled system. One reach (AHP-002), immediately upstream of Fekete Drain, was assessed and is shown on Map 4. Water parameter measurements were taken and are provided in Table 8.

Table 10. Water Parameter Measurements in the Unnamed Tributary

Reach	Time Taken (hrs)	Air Temp (ºC)	Water Temp (ºC)	Conductivity (mS/m)	TDS (ppt)	pH
Reach 1 (AHP-002)	18:30	26	12	0.45	0.5	6.7

Reach AHP-002

Reach AHP-002 of the Unnamed Tributary of Fekete Drain is characterized as a shallow, poorly defined feature (0.05 - 0.1m deep) with wetted widths ranging from 0.1 to 0.3m. Patches of Marsh Marigold (Calta palustris) and Skunk Cabbage (Symplocarpus foetidus) were observed throughout the area of the Unnamed Tributary. Substrates within this reach were observed to be predominantly organic. The feature was observed to be very poorly defined through a linear wetland unit within the larger surrounding woodland habitat.

4.2.2 Thermal Regime Monitoring

The results of the 2021 water and air temperature monitoring showed a relatively consistent pattern of surface water temperatures across all stations, with characteristic variation in water temperatures associated with significant precipitation events (Figure 1). Temperature logger locations are shown on Map 4. Three loggers were placed within Fekete Drain (TMP-001, TMP-002, and TMP-005) with an additional logger placed for air temperature on a tree within the woodland (TMP-003). One logger (TMP-004) was placed within the Unnamed Tributary, but as this feature is intermittent, the temperatures are not reliable. The results shown for Fekete Drain are to be expected from a system heavily influenced by surface water runoff. The water temperature results are also highly reflective of the recorded daily air temperatures. These results are indicative of aquatic systems that are significantly influenced by stormwater management pond releases and upstream surface water inputs.

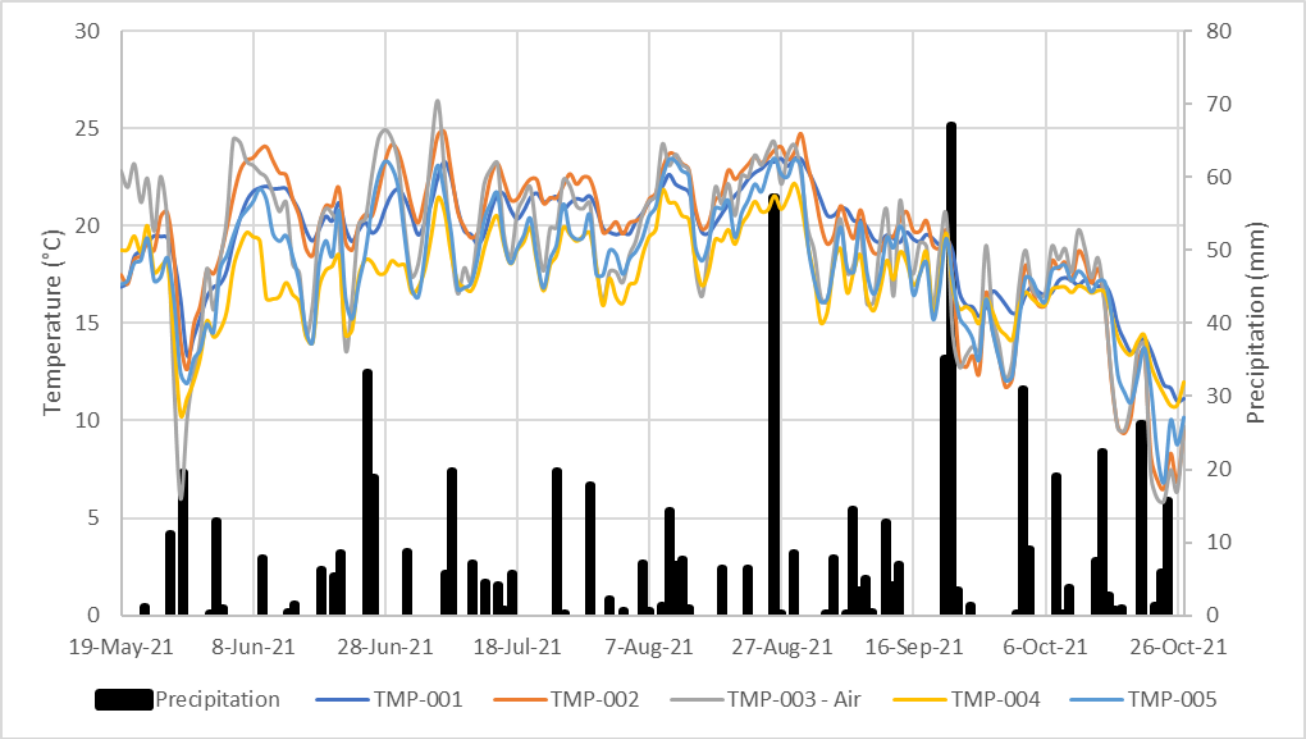

Figure 1. 2021 Surface Water Temperature Monitoring Fekete Drain and Unnamed Tributary

As shown on Figure 1, TMP-005, which is the logger furthest downstream, consistently shows slightly cooler temperatures than TMP-001. The logger within the Unnamed Tributary (TMP-004) is generally consistent with air temperature data throughout July and early August suggesting that water depths within feature may reduce significantly, exposing the temperature logger to air and resulting in temperature monitoring results that may not accurately represent the water temperatures.

Figure 2 below, shows the thermal designations with the temperature monitoring points from the features. Baseline thermal regime determination within Fekete Drain suggests a “Warm-Cool” water thermal regime.

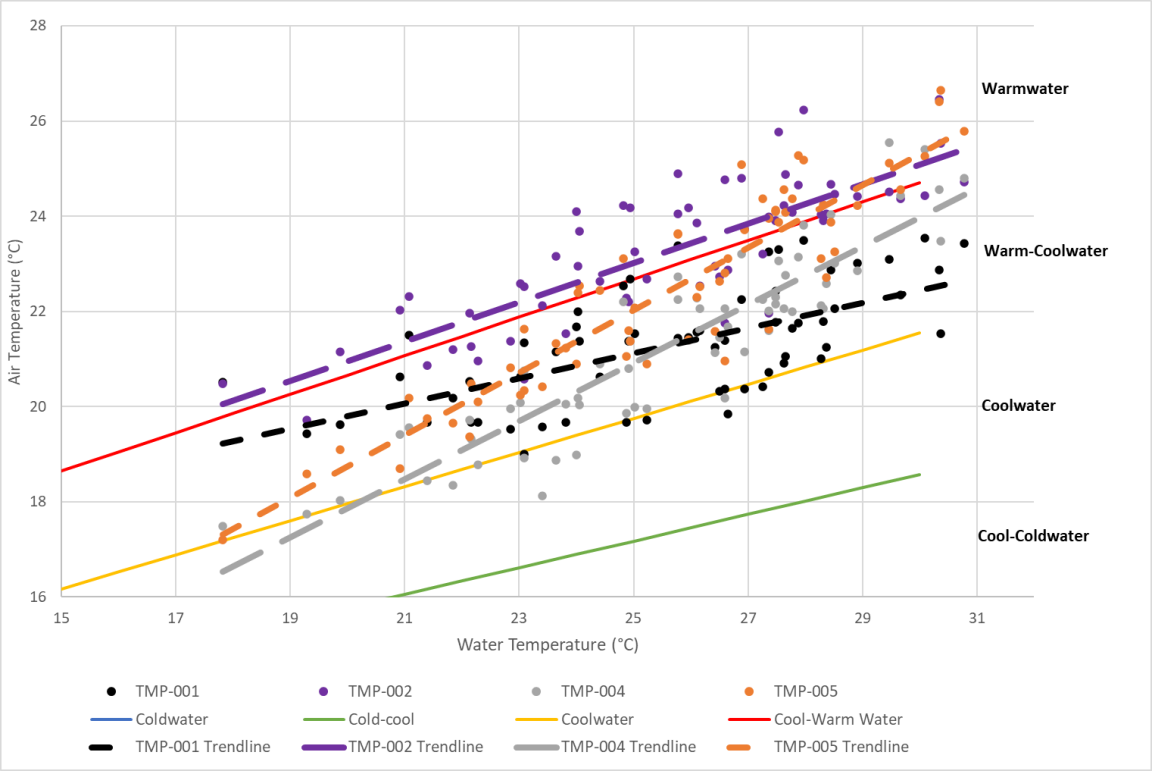

Figure 2. 2021 Thermal Regime Monitoring

4.2.3 Fish Community

In total, 10 common species of freshwater fish were captured from Fekete Drain during the survey, as shown in Table 10. None are considered to be significant species. No freshwater mussel species were observed within the drain. The species captured by NRSI are similar to the findings provided in the BioLogic memo (2019), with the exception that they observed Fathead Minnow (*Pimephales promelas*) in very small numbers, as well as from the UTRCA background information for Fekete Drain. A complete list of fish species and mussel species reported from the study area (including Thames River) is provided in Appendix V.

Table 11. Fekete Drain Fish Capture Results 2021

Common Name	Scientific Name	Thermal Regime[1]	Tolerance[1]	EMS-001	EMS-002	EMS-003	EMS-004	EMS-005
Bluntnose Minnow	*Pimephales notatus*	Warmwater	Intermediate	19	1	4	16	--
Brook Stickleback	*Culaea inconstans*	Coolwater	Intermediate	--	2	--	2	--
Central Stoneroller	*Campostoma anomalum*	Coolwater	Intermediate	1	--	3	8	--

Common Name	Scientific Name	Thermal Regime[1]	Tolerance[1]	EMS-001	EMS-002	EMS-003	EMS-004	EMS-005
Common Shiner	*Luxilus cornutus*	Coolwater	Intermediate	1	--	--	5	--
Creek Chub	*Semotilus atromaculatus*	Coolwater	Intermediate	28	37	47	55	7
Iowa Darter	*Etheostoma exile*	Coolwater	Intermediate	--	--	1	--	--
Northern Redbelly Dace	*Chrosomus eos*	Coolwater	Intermediate	--	--	4	16	1
Pumpkinseed	*Lepomis gibbosus*	Warmwater	Intermediate	--	--	--	7	--
Western Blacknose Dace	*Rhinichthys obtusus*	Coolwater	Intermediate	25	27	23	42	--
White Sucker	*Catostomus commersonii*	Coolwater	Tolerant	--	--	--	3	--
			Species Richness	5	4	6	9	2
			Total Catch	74	67	82	154	8

[1]Eakins 2022

The fish community composition documented within Fekete Drain consists primarily of intermediately tolerant coolwater species, typical of a cool-warmwater watercourse. The fish community results are consistent with thermal regime monitoring of Fekete Drain. The dominant fish species captured from Fekete Drain was Creek Chub (*Semotilus atromaculatus),* which are a common, widespread coolwater fish species found throughout Ontario in a wide variety of habitats.

The tributary to Fekete Drain was dry at the time of fish community surveys. No fish or mussels were observed from the tributary during any field assessments. The tributary provides indirect fish habitat.

4.2.4 Benthic Invertebrate Sampling

Benthic macroinvertebrate monitoring stations (BTH-001 to BTH-003) are shown on Map 4 and are summarized by station in Table 11. BTH-001 is located within dense coniferous forest habitat providing up to 100% shade. This station is located within a meadow marsh, with limited shading. BTH-002 is located within a meadow marsh, with limited shading. BTH-003 also has limited shading.

Table 12. Fall Benthic Sampling Conditions October 28, 2021

Station	BTH-001			BTH-002			BTH-003		
Time (hrs)	10:00			10:45			11:15		
Water Temperature (°C)	11.0			10.0			8.5		
Dissolved Oxygen (ppm/%)	4.74ppm / 43.5%			4.53ppm / 40.3%			3.74ppm / 32.0%		
Habitat	Riffle 1	Pool	Riffle 2	Riffle 1	Pool	Riffle 2	Riffle 1	Pool	Riffle 2
Wetted Width (m)	1.65	2.7	2.8	4.2	5.0	5.0	1.5	3.8	1.5
Maximum Depth (m)	0.11	0.3	0.1	0.5	0.5	0.5	0.31	0.5	0.45
Maximum Hydraulic Head (mm)	40	0	25	0	0	0	25	2	30
Dominant Substrate	Gravel	Gravel	Gravel	Silt	Silt	Silt	Silt	Silt	Sand
Second Dominant Substrate	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Silt
Total Transect Length (m)	10	10	10	10	10	10	10	10	10
Kick & Sweep Sampling Time (min:sec)	3:00	3:00	3:00	3:00	3:00	3:00	3:00	3:00	3:00

The results for each sampling station are presented in Table 12, with raw data provided in Appendix VI. The results of 2021 monitoring will serve as baseline for future monitoring and have been compared to 2019 monitoring to further characterize the conditions at each station.

Table 13. Calculated Benthic Macroinvertebrate Metrics 2021

Benthic Invertebrate Assessment Metric	BTH-001	BTH-002	BTH-003
Taxa Richness	19	16	17
Dominant Taxa, % of total sample	15.54%	13.40%	41.74%
Subdominant Taxa, % of total sample	10.81%	10.10%	8.26%
Sensitive Groups			
EPT taxa richness	5	2	1
% EPT	5.2%	9.7%	0.7%
Tolerant Groups			
% Oligochaetes	0.0%	0.0%	0.0%
% Diptera	45.9%	40.6%	34.6%
% Chironomidae	44.6%	40.0%	32.8%
Functional Feeding Groups			
% Collector-Filterers	25.7%	28.9%	18.3%
% Collector-Gatherers	62.6%	35.7%	62.2%
% Predators	7.2%	1.9%	0.0%
% Scrapers	4.5%	8.2%	4.1%
% Shredders	0.0%	6.8%	0.0%
Diversity and Biotic Indices			
Shannon Wiener Index	2.68	2.58	2.15
Family Biotic Index	5.32	5.44	5.06
FBI Water Quality	Good	Good	Good
Biotic Index	6.72	6.18351	6.46739
BI Water Quality	Poor	Fairly poor	Fairly poor
Simpsons	0.919	0.918	0.795

Potentially Unimpaired Potentially Impaired

During 2021 benthic invertebrate community monitoring, taxonomic richness was observed to be relatively consistent across all monitoring stations, falling generally within the potentially unimpaired range. Both the richness and proportion of sensitive EPT taxa were observed to be quite low, falling within the potentially impaired range, with a slight trend toward greater richness and proportion in the lower reaches of Fekete Drain. When comparing the proportion of tolerant taxa, the lack of *Oligochaetes* across all monitoring stations indicates potentially unimpaired

conditions, however, elevated proportions of *Chironomidae* across all monitoring stations falls within the potentially impaired range.

Overall, the dominant functional feeding group across all monitoring stations was observed to be the Collector-Gatherers (C-G) during 2021 monitoring, a group which consisted primarily of members of the highly tolerant family *Chironomidae* which were observed in elevated concentrations across all monitoring stations.

The Shannon-Weiner (H') Index measures diversity, taking into account the number of species and their evenness. H' Index results fall within the typical range of potentially unimpaired values (MacDonald 2003) across all monitoring stations. Overall, the H' Index calculations indicate a low to moderate benthic taxonomic richness and species evenness within the study area (MacDonald 2003). No H' calculations were below 1.5, suggesting that the benthic invertebrate communities within Fekete Drain had limited taxonomic diversity within a benthic community dominated by fewer taxa.

In general, the Family Biotic Index (FBI) values were considered to be 'Good' across all monitoring stations suggesting a potentially unimpaired system. This is consistent with the Biotic Index (BI) values ranging from 'Poor' to 'Fairly Poor' during 2021, but remaining consistently within the potentially unimpaired range in 2021. This potentially unimpaired range for BI is based on the Hilsenhoff Biotic Index. Overall, all the results of 2021 monitoring suggest potentially unimpaired environmental conditions across benthic macroinvertebrate monitoring stations, with a healthy, if limited, benthic macroinvertebrate community throughout Fekete Drain.

When compared to 2019 benthic monitoring results, the benthic macroinvertebrate community within Fekete Drain in 2021 showed a significant increase in Taxa Richness, EPT richness, and overall macroinvertebrate density and diversity. This is potentially due to the lack of standardized sampling methodologies during the 2019 monitoring, resulting in lower resolution of benthic macroinvertebrate community data. As such, the results of 2021 benthic macroinvertebrate community monitoring serve as a more complete assessment of the Fekete Drain benthic macroinvertebrate community and provide a more suitable baseline for future monitoring.

5.0 Evaluation of Significance

An analysis of the significance and sensitivity of natural features within the subject lands was completed in order to identify those features and habitats that are sensitive to disturbance. This analysis is based on the rarity or significance of features and/or associated functions/processes and/or current policies, legislation, or planning related studies. Such features and functions identified as sensitive to disturbance are further identified as 'constraints' to development, prohibiting or constraining aspects of any proposed development around or within them. These features are discussed in the context of natural heritage policies that govern their protection. Conversely, opportunities for development may occur outside of these natural environment constraints within the subject lands. Results of this analysis have been provided as input to the proposed development plan in order to avoid and reduce impacts to natural features and functions. Each potential constraint is shown on Map 5. A summary of this analysis for the proposed development lands study area is discussed below.

5.1 Significant Wetlands and Wetlands

Additional wetland areas were identified by NRSI and agency staff during field studies completed in 2021 and 2022. As outlined below, and supported by the memo on the Evaluation of the Wetlands (Appendix VII), none of the wetlands within the study area warrant Provincially Significant Wetland designation. As provided in the London Plan (2020), all wetland features, regardless of their size or designation, are protected and subject to the Natural Heritage System policies.

The wetlands within the subject lands were evaluated as follows. In order to determine if the wetlands should be considered provincially significant, a review was originally completed using the 2014 Ontario Wetland Evaluation System (OWES) criteria (MNRF 2014). Preliminary discussion regarding wetland significance occurred with City of London Ecologist Shane Butnari in a memo dated March 10, 2022; however, a re-assessment was required following a review of the on-site wetlands in the summer of 2022. The memo outlining the Evaluation of the Wetland Units at 2004 Hamilton Road (dated November 8, 2022) has been included in Appendix VII. Furthermore, the 4th Edition of the OWES Manual (MNRF 2022) has been released since the evaluation was completed, which further confirms that the wetlands are not of provincial significance as the new guidelines generally no longer complex wetland units.

A catchment for the wetlands was determined as a starting point and incorporated additional wetland units to the east of Veterans Memorial Parkway for consideration (Map 1 in Appendix VII). The catchment extent is based on an automatically generated catchment layer derived using the Ontario Watershed Flow Assessment Tool. The confluence of Fekete Drain with the Thames River presents a reasonable location for determining the catchment, which includes lands on the west and east side of Veterans Memorial Parkway. The 403.74ha catchment extends south of Bradley Avenue, almost to Highway 401.

All wetlands within this catchment were mapped using verified field data from the subject lands, as well as aerial photography interpretation and topographic mapping for wetlands offsite. A total of 6 wetland units are present within the study area (Map 1 Appendix VII), with 4 wetland units present in the upper portion of the catchment, east of Veterans Memorial Parkway. There are no provincially significant wetlands (PSW) within proximity to the subject lands. The closest PSW is the Meadowlily Woods PSW, located 1.5km to the west.

Area measurements of all 10 wetland units indicate that all are less than 2ha in size, with 6 being less than 0.5ha. Of the wetland units within the subject lands, only 1 unit is more than 0.5ha, with an area of 0.81ha. Based on OWES methodology (p. 48 of the manual), wetland units less than 0.5ha are to be excluded from the evaluation unless they are considered a "specialized community", which could include a bog or fen or particular habitat for a rare species. The manual text also identifies:

> "*In general, wetlands smaller than 2 ha (5 acres) are not evaluated. However very small wetlands can provide habitat for wildlife or serve other ecological, hydrological, hydrogeological or social functions. This is particularly true in wetland complexes. A single contiguous wetland smaller than 2 ha, and wetland complexes less than 2 ha in size (i.e., total area of all wetland units) can be evaluated provided that the rationale for including them is attached to the Wetland Evaluation Data and Scoring Record.*"

Based on the multi-season field surveys that were completed, as well as the interpretation of the vegetation composition for the off-site wetlands to the east of Veterans Memorial Parkway, none of the wetland units would be considered a specialized community.

Additionally, no SAR were documented during the surveys. The most notable observations relating to the on-site wetlands were the presence of Terrestrial Crayfish chimneys within some MAM2 polygons, as well as the presence of Jointed Rush (*Juncus articulatus*) and Greater Duckweed (*Spirodela polyrhiza*), both considered rare in Middlesex County (Oldham 2017).

None of the wetland units are considered a specialized community and no SAR were documented from these wetlands during surveys. As such, the wetlands are not provincially significant.

As per the City of London Environmental Management Guidelines (2021), wetland community boundaries must consider the Critical Function Zone (CFZ) in constraint mapping and site planning. CFZs are non-wetland areas within which biophysical functions or attributes directly related to the wetland occur (Environment Canada, 2013). Based on the multi-season field surveys that were completed, it was determined that the two of the four on-site wetland communities (MAM2) do not contain CFZs (e.g., upland foraging or nesting area for breeding amphibians and wetland birds) that are to be included in the overall wetland feature limits. The remaining wetland communities (SWT3) are to be protected within the ESA boundary.

5.2 Significant Woodlands and Woodlands

The London Plan (2020) recognizes Significant Woodlands; however, none have been identified within the subject lands (as per the Natural Heritage Map 5 of the London Plan). The Middlesex Natural Heritage Systems Study (2014) indicates a feature within the subject lands that met at least one criteria for significance, but the mapping was completed prior to the Meadowlily Woods ESA being identified, as well as prior to clearing that occurred in early 2016 within a Plantation on the subject lands.

The ESA does not extend to the edge of the woodland, as shown on Map 1.

Woodland areas that have not been evaluated within the London Plan need to be evaluated as per the criteria for woodland significance as outlined in Policy 1341 of the London Plan. Woodlands are to be assessed using all the ELC polygons that make up the component of the patch (which includes plantations, CUP).

The London Plan states:

> *"A woodland will be considered significant if it achieves a minimum of one High or five Medium criteria scores as determined by application of the City Council approved Guidelines for the Evaluation of Ecologically Significant Woodlands."*

As per the City of London Environmental Management Guidelines (2021), Woodlands that have not been evaluated should be evaluated using the criteria. NRSI has completed the Evaluation

Criteria for the woodland feature as a whole, and through the feature delineation reviewed with the City in the field. This Criteria has been appended to this EIS (Appendix VIII). Based on this evaluation, the woodland at the north end of the subject lands, including the CUP3-3 feature associated with Fekete Drain, meets the criteria for Significant Woodland. The adjacent CUS was excluded from the Significant Woodland as it was excluded from the dripline delineation reviewed in the field with City staff (Map 2). The Significant Woodland is shown on Map 5. The CUW feature in the southwest of the subject lands is not significant. The Criteria for the CUW feature have been appended to this EIS as well (Appendix VIII).

5.3 Significant Valleylands

The London Plan (2020) identifies the full length of Fekete Drain within the study area as Significant Valleyland (Map 5 of the Plan). Significant Valleyland is identified as having a minimum width of 30m on each side of the watercourse top-of-slope. The top-of-slope measurement was determined by Development Engineering (2024) and was based on topographic survey grade tag identifications. Momentum Earth Sciences (2025) identified Fekete Drain within the subject lands as actively in transition with evidence of platform adjustment or widening with a 29m recommended meander belt and a 6m erosion allowance for stable slopes and meander belt limits in compliance with the London Plan. The revised Significant Valleyland is shown on Map 5.

5.4 Environmentally Significant Areas

The City of London recognizes Environmentally Significant Areas (ESA), which often capture a complex of wetlands, woodlands, SWH, and / or valleylands. As per Map 5 (Natural Heritage) of the London Plan (2020), the Meadowlily Woods ESA is located just north of the subject lands (see Map 1 of this report). As outlined in policy 1369 of the London Plan, certain lands adjacent to recognized ESAs may have potential for inclusion if warranted on the basis of site-specific evaluation through the application of the Environmental Management Guidelines (2021).

NRSI has completed a review of the vegetation communities adjacent to the existing ESA boundary and based on the additional guidance provided by the City of London (Appendix I), the ESA boundary was revised to include the greatest limit of either the Significant Woodland (surveyed dripline), and/or the revised Significant Valleyland where the feature overlaps the Significant Woodland (Map 5).

In accordance with the EMG Boundary Delineation Guidelines (Guideline 3), projections of naturalized vegetation that are less than 30m wide may not qualify for inclusion within a feature boundary. Therefore, the four small MAM2 communities were excluded from the ESA boundary.

The revised ESA boundary was agreed to in consultation with the City of London, as identified in the correspondence attached in Appendix I.

5.5 Watercourses and Fish Habitat

NRSI confirmed direct fish habitat within Fekete Drain, which is a permanent watercourse. Indirect fish habitat is provided by the Unnamed Tributary to Fekete Drain. The *Fisheries Act* protects fish and fish habitat (as identified within the Act) up to the high-water mark.

Fekete Drain is regulated by the UTRCA, which will review and make decisions on applications for permits in accordance with Part VI of the Conservation Authorities Act and Ontario Regulation 41/24. Development, interference or alterations within the regulation limit (15m) of Fekete Drain may be permitted if, in the opinion of the UTRCA, the development will not affect the control of flooding, erosion, dynamic beaches, and unstable soil or bedrock.

5.6 Species at Risk

Seven bat SAR (Section 4.1.5) may occur within the subject lands. Based on the site review, no candidate bat roosting trees were identified within the area where tree removals are anticipated (southeast and southwest corners). Candidate SAR bat habitat is located within the woodland, including all treed communities (FOD, CUP, CUS). The woodland is presumed habitat as acoustic SAR bat surveys were not undertaken.

5.7 Significant Wildlife Habitat

The Significant Wildlife Habitat Technical Guide (SWHTG) outlines the types of habitats that the MNR considers significant in Ontario, as well as criteria to identify these habitats (OMNR 2000 and 2010). Each of these broad categories is discussed further in the following sections. Refer to the SWH screening table (Appendix III) for an analysis of each SWH type assessed within the subject lands. Based on background information review, desktop analysis, and field studies, two SWH types were confirmed within the study area with five additional SWH types identified as candidate (Table 14). These are shown on Map 5.

Development or site alteration within SWH is not permitted under the PPS or the London Plan unless it has been demonstrated that there will be no negative impacts on the habitat or its ecological functions (OMMAH 2020, London Plan 2023).

Table 14. Significant Wildlife Habitat

Significant Wildlife Habitat Type	Assessment Result
Raptor Wintering Area	Suitable habitat for Raptor Wintering is present within the woodland feature along the northern edge of the subject lands and study area associated with the Meadowlily ESA. Specific studies to determine winter usage of the habitat was not conducted within the study area as it was determined the Forested feature was likely SWH due to its connectivity with the Thames River and known usage of Bald Eagles along the Thames River. The forested communities associated with the Meadowlily Woods ESA have been shown on Map 5 as candidate habitat. As nesting Red-tailed Hawk was observed within the CUP, this SWH is shown as candidate habitat within the subject lands.
Bat Maternity	Suitable habitat for Bat Maternity is present within the FOD and SWT features within the larger woodland within the study area. Suitable ecosites were not present within the subject lands. Detailed site assessments were not conducted within the FOD features within the larger woodland (associated with the Meadowlily Woods ESA) and this remains as candidate SWH as shown on Map 5.
Woodland Raptor Nesting Habitat	Stick nest surveys were completed during SWH assessments, as well as breeding bird surveys to document nesting birds. No nesting by species considered significant were observed within the subject lands and as such, SWH is considered not present. Detailed surveys were not completed from the with the study area (Meadowlily Woods ESA) which is considered candidate.
Woodland Area-Sensitive Bird Breeding Habitat	Breeding bird surveys focused on the subject lands rather that the study area where the ESA is present, as it is known to provide habitat to environmentally sensitive species. Bird surveys conducted on the site did not confirm presence of nesting of 3 or more of the listed wildlife species for this SWH. As detailed surveys were not conducted within the study area, this SWH is considered candidate outside out the subject lands.
Terrestrial Crayfish	Suitable habitat for Terrestrial Crayfish is present within the subject lands and study area. Through field investigations two different locations were identified within the subject lands as containing crayfish chimneys. These two MAM inclusions are identified as confirmed SWH and are shown on Map 5.
SCC Eastern Wood-Pewee	Eastern Wood-Pewee individuals were recorded during breeding bird surveys and other site visits within the FOD feature within the study area. Breeding habitat (SWH) for this species is considered present within the study area in FOD and SWT features (Meadowlily Woods ESA area).
SCC Barn Swallow	Barn Swallow was confirmed foraging within the subject lands. Breeding habitat for this species is considered present in the within the

Significant Wildlife Habitat Type	Assessment Result
	study area in the barns or agricultural outbuildings on the property to the immediate west of the subject lands, but not within the subject lands themself.

5.8 Corridors and Linkages

Within the landscape context, the Fekete Drain and natural riparian cover associated with it is important for the movement of local wildlife between larger woodland areas both to the north and south, and associated with the Thames River.

5.9 Summary of Natural Feature Constraints

Table 15. Summary of Natural Feature Constraints

Natural Feature Constraint	Regulatory and Permitting Considerations	Project Considerations
Significant and Unevaluated Wetlands	• Provincial Planning Statement (OMMAH 2024) • London Plan (2023) • Policy 1332, 1333, 1334, 1335, & 1336. • O. Reg. 41/24	• No PSW's within the study area. • No significant wetlands within the subject lands. • London Plan Policy 1334 indicates that for non-PSW, there shall be no net loss of the wetlands' features or function. In some instances, and in consultation with the UTRCA, the City may consider the replacement of wetlands rather than in situ protection where the features and functions of the wetland may be provided elsewhere and would enhance or restore the NHS. Replacement is required at a minimum ratio of 1:1.
Significant Woodland, and Woodlands	• Provincial Policy Statement (OMMAH 2020) • London Plan (2023) • Policy 399, 1337, 1338, 1339, 1340, 1341, 1342, 1343	• The woodland at the north end of the subject lands, including the CUP3-3 feature associated with Fekete Drain, based on the EMG Woodland Evaluation comes out as significant. • The southwest CUW is not considered significant based on the EMG Woodland Evaluation. • Policy 399.5 indicates trees that are removed as a result of new municipal development or infrastructure works, will be replaced using the approach identified in 399 4.a. and 4.b. • Policy 1342A indicates that development and site alteration shall not be permitted in significant woodlands unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

Natural Feature Constraint	Regulatory and Permitting Considerations	Project Considerations
Significant Valleylands	• Provincial Policy Statement (OMMAH 2020) • London Plan (2023) • Policy 1344, 1344A, 1344B, 1449, 1350	• Significant valleyland is associated with the Fekete Drain. • Development and site alteration shall not be permitted unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological function. • London Plan Policy 1350 s.2 indicates that minimum width of valleylands will generally be comprised of 30m on each side of the watercourse measured from the high-water mark. • Hazard areas (i.e. valley slopes) are regulated by UTRCA.
Significant Wildlife Habitat	• Provincial Policy Statement (OMMAH 2020) • London Plan (2023) • Policy 1352, 1353, 1354	• Development or site alteration in or adjacent to SWH is not permitted unless it has been demonstrated that there will be no negative impacts on the features or their ecological function.

Habitat for Threatened and Endangered Species	• Endangered Species Act, 2007
	  • O. Reg 830/21
	• Species at Risk Act
	• Provincial Policy Statement (OMMAH 2020)
	• London Plan (2023)
	  • Policy 1325, 1326, 1327, 1328
		• Candidate Habitat for SAR Bats present within treed areas including FOD, CUP, CUS communities.
		• Development and site alteration shall not be permitted in the habitat of endangered or threatened species, except in accordance with provincial and federal requirements.

Fish Habitat	• Provincial Policy Statement (OMMAH 2020) • Federal Fisheries Act (1985) • London Plan (2023) • Policy 1323, 1324	• Fish habitat is present within Fekete Drain within the subject lands. • Development and site alteration shall not be permitted in fish habitat except in accordance with relevant provincial and federal requirements. • Crossings and in-water work need to consider fish habitat.
Linkages and Corridors	--	• Fekete Drain provides a north-south linkage for wildlife, connecting to the Thames River in the north. Crossings need to consider wildlife movement corridors as to avoid impacting linkage to the Thames River.

6.0 Ecological Buffers

Ecological buffers are required for natural heritage features such as woodlands, wetlands, and significant wildlife habitats to protect them from impacts during and after development. Properly functioning buffers protect natural features against sedimentation, erosion, provide attenuation of precipitation and run-off, protect against human disturbances, serve as habitat transition zones, and contribute to the protection of the natural feature through, for example, maintaining microclimate conditions and limiting the spread of invasive species to within the sensitive natural feature.

The outer limit of the buffer determines the constraint to development activities within the subject lands. All development, including any form of construction or grading, is to remain outside of the recommended buffer limits, where possible.

The City of London EMG (2023), indicates the minimum buffers for Significant Woodlands are 30m from the dripline edge, 30m from Significant Wetlands and 15m from non-significant wetlands, and 30m from the high-water mark. Minimum buffers for the Habitat of Endangered and Threatened Species, as well as SWH are determined on a case-by-case basis as the minimum width depends on a range of factors including the species identified and their lifecycle processes.

The proposed development must conform to the recommended minimum buffers widths unless it is demonstrated that the natural heritage features or functions will be adequately protected by a narrower buffer (London Plan 2023). Ecological buffers are illustrated on Map 6, and are further outlined below in Table 16. Buffers are discussed below in the context of impact avoidance and mitigation.

Table 16. Buffers

Natural Heritage Feature	Significance/ Sensitivity	Natural Environment Buffers
Meadowlily Woods ESA (CUP3-3, CUP3-2, SWT3, FOD5-7, FOD3-1, CUT)	Significant Woodland, Wetland and Significant Valleyland	30m buffer from the surveyed Significant Woodland dripline. Minimal grading encroachment into the Significant Woodland buffer is proposed from the Fekete Drain crossing. Areas of bare soil will be re-vegetated after grading.
Fekete Drain (CUP3-3, MAM2 and CUM)	Significant Valleyland, Watercourse, Significant Woodland, Wetland	30m buffer from high watermark (top-of-bank) on watercourse (both sides), and 30m buffer from Significant Woodland dripline, with the

Natural Heritage Feature	Significance/ Sensitivity	Natural Environment Buffers
		exception of the proposed crossing. No buffer proposed from wetland inclusions, but compensation is proposed for impacts.
Cultural Savanah (CUS)	None	No buffer proposed. CUS was not included in the woodland delineation completed with City ecologists.
Mineral Meadow Marsh (MAM2)	Wetlands	A portion of the southern MAM2 will be protected within the extent of the Significant Valleyland. 0.75ha of MAM2 is proposed for removal and an additional area of 0.18ha of MAM2 impacted (within 15m of proposed development). At least 0.93ha (0.75ha+0.18ha) of wetland compensation is proposed.
Cultural Woodland (CUW)	None	Feature to be removed and compensated. No buffer proposed.
Cultural Meadow (CUM1)	None	Feature does not require protection. No buffers proposed.
Terrestrial Crayfish Habitat (MAM2)	SWH	A 30m buffer is proposed around the Terrestrial Crayfish burrows. There may be grading within the outer 10m from the southern Terrestrial Crayfish habitat area due to the proposed road crossing. This area will be revegetated following grading.

7.0 Impact Analysis and Recommendations

Details of the proposed development are included in the following supporting documents: Draft Plan of Subdivision (DevEng 2025a), Flood Line Delineation Study (DevEng 2025b), Preliminary Stormwater Management Report (DevEng 2025c), Geomorphic Assessment (Momentum 2025), and Geotechnical Investigation and Hydrogeological Assessment (Stonecairn 2025). Refer to Map 6 for the proposed development plan and Appendix IX for the Draft Plan of Subdivision (DevEng 2025).

7.1 Proposed Development

The proposed development includes four blocks that are designated for industrial or commercial development as shown in Appendix IX (DevEng 2025a). It also includes an interim street access and the ultimate site access. Both access routes connect with a proposed crossing over Fekete Drain. The proposed Fekete Drain crossing structure is anticipated to consist of a 41.5m long 1.8mx3.9m concrete box culvert, suitable to convey the predicated flows of a 250-year storm event while meeting the UTRCA and MNR requirements for crossing structures within regulated areas. The final design is to be confirmed during the detailed design phase. Components of the development are described below. At this time, for the purposes of the Draft Plan application, a “worst case scenario” has been presented. It is anticipated, that through detailed design, the road crossing across Fekete Drain can be narrowed, and the grading impacts can be reduced as well.

7.1.1 Fekete Channel Crossing

In order to facilitate road access to the proposed development a new Fekete Drain crossing structure will be required. The proposed crossing structure is anticipated to consist of a 41.5m long 1.8x3.9m concrete box culvert with a 0.27% slope, the largest structure suitable to convey up to a 250-year regional flooding event with the final design and specific impacts to fish and fish habitat determined during the detailed design phase. The new culvert structure will be designed to minimize impacts to fish and fish habitat and engineered in such a way to avoid impacts to surface water flows to downstream resources. Impact from the required culvert will be minimized by selecting the most appropriate type of crossing structure, limiting the crossing structure width and grading limit length, and sizing the structure appropriately according to municipal engineering standards to minimize the potential alterations to instream hydrology, scouring, and flooding, while also considering wildlife movement through the culvert.

7.1.2 Stormwater Management

The approach to SWM is described in detail in the Preliminary Stormwater Management Report (DevEng 2025). The report takes into account existing conditions along with the proposed subdivision plan and SWM design criteria to ensure that quantity, quality and water balance controls align with existing conditions on site and the required parameters as per relevant background documents, as cited in the Preliminary Stormwater Management Report, including the accepted Thames Valley Areas Subwatershed Study (Aquafor Beech 1995).

Stormwater flow modelling divided the subject lands into 17 subcatchments, 16 directing flows toward Fekete Drain and one directing flows north toward into the Thames River. As part of the Preliminary Stormwater Management Report, the stormwater conditions within each proposed development block were modelled with separate storage and outlet nodes to estimate the storage volume/control for each block, under the assumption that specific management strategies will be addressed during the detailed design phase.

Given the topographic and spatial constraints throughout the subject lands no centralized SWM facility is proposed for the final development plan. The proposed stormwater management approach will mitigate impacts through the use of minor permanent private systems within each industrial/commercial block to reduce peak runoff rates/volumes and mitigate suspended solids prior to discharge into through two dedicated outlet structures Fekete Drain. Major overland flows will be conveyed through the ROWs, directing runoff in excess of the minor system capacity to dedicated overland spillways into Fekete Drain.

The preliminary SWM design is expected to meet the local SWM requirements, and will require approximately 2,817m^3 of stormwater storage across all development blocks to address up to a 100-year rain event, and allow for the safe conveyance for up to an estimate 250-year rain event via overflow channels while attenuating flows rates and discharge to Fekete Drain.

Stormwater quality treatment within each permanent private systems will meet the “Normal” level of protection (70% TSS Removal) in accordance with subwatershed targets and, where practical, allow for a treatment-train approach for further quality control. Final details of the permanent private systems and overflow conveyance systems will be developed during the detailed design phase, and will include the installation of hydrodynamic (oil/grit) separators to allow for the treatment of surface runoff from all paved driveway/parking areas before directing flow to storm sewer collector systems. Erosion and scour protection systems will be installed at

each of the anticipated outlet structures to mitigate impacts to Fekete Drain to address up to a 25mm storm events event.

Water balance analysis completed by Stonecairn Consulting (2025) assessed the anticipated reduction in infiltration from pre-development conditions. Given the low permeability of the surface and subsurface soils onsite, recharge opportunities are limited, however where practical, infiltration from clean sources is proposed to mitigate the effects of post development infiltration reduction on adjacent wetland habitat.

7.1.3 Water Balance

According to City of London requirement, water balance calculations are required for proposed developments adjacent to wetlands. Calculations related to water balance are provided in the Geotechnical Investigation & Hydrogeological Assessment prepared by Stonecairn Consulting (2025), which assessed the anticipated impacts to the northern woodland and Fekete Drain without any on-site controls, as those are to be designed during the Site Plan approvals process. As per the results of the assessment, it is anticipated that the proposed development of the subject lands will not alter the water balance assessment for the woodland, located to the north of the proposed development lands. However, the proposed development will result in a decrease in annual discharge into Fekete Drain. It is recommended by Stonecairn that low-impact development (LID) measures are incorporated during the detailed design stage to attenuate or provide temporary storage of stormwater, and/or promote infiltration. Such methods may include grassed swales, thick topsoil layer, reduced lot grading, and discharging water from roof leaders into landscaped areas. Infiltration on site is very limited due to the low permeability soils. It is acknowledged that the detailed stormwater design must achieve post-development water quantity levels within 10% of the pre-development levels. The development of the site must ensure that the existing wetlands and proposed compensation wetlands are maintained through appropriate water balance.

7.2 Natural Feature Impacts and Compensation

As can be seen on Map 6, notwithstanding the proposed crossing of Fekete Drain, the recommended ecological buffers as described in Section 6 have been achieved to protect existing natural heritage features. However, several vegetation communities are proposed for removal or partial removal within the subject lands to accommodate and implement the proposed development concept. The proposed vegetation community removals will be

compensated for through habitat creation and restoration along the outside edges of the Meadowlily Woods ESA and southern Significant Valleyland limit within the subject lands. Encroachment into natural features and vegetation communities is described in the sections below, along with proposed mitigation and compensation measures. Proposed removals of vegetation communities and proposed compensation areas are shown on Map 7a.

Replacement and compensation of natural heritage features, where permitted by the City, shall be implemented on at least a one-for-one (1:1) land-area basis (as per *The London Plan* Policies 1334, 1342B, 1401 and 1402) and, at a minimum, aim to replace any ecological functions associated with the removed feature. Replacement and compensation features will require buffers wherever the feature is to be abutting a non-natural land use (e.g., road, parking lot, etc.). Buffer widths are to be determined based on the guidance provided in Section 5 of the EMG (City of London 2021) and in consultation with the City. In addition, replacement and compensation projects require long-term monitoring to assess progress towards no net loss or, preferably net environmental benefit (or net positive effects, as per Section 2.6.6.7 of the EMG), and may require additional adaptive management actions to achieve the established ecological objectives.

7.2.1 Wetland Removals and Compensation

Four small wetland (MAM2) projections are proposed for partial removal from the subject lands to accommodate development within Block 5 and the proposed Fekete Drain crossing. The amount of MAM2 that is proposed for removal is 0.75ha (Map7a). The projections were assessed as not significant as they are less than 30m wide, are very small, and lack of significant functions. NRSI calculated an “Impacted Wetland” area of 0.18ha (Map 7a). This impacted area was calculated as a reverse 15m buffer, where development is proposed directly adjacent to the existing MAM2 wetlands. As a result, a total minimum replacement area of 0.93ha was calculated to compensate for the wetland portions proposed for removal (0.75ha), and the wetlands located within 15m of the future development (0.18ha).

The primary ecological function of the four wetlands is the collection of surface water flows and floodwater during spring melt and significant rainfall events. Three of the marshes direct surface water toward Fekete Drain, while the fourth directs water north to the Unnamed Tributary (which flows west and into Fekete Drain).

Through correspondence with City ecologists, it was determined that these features could be impacted to facilitate development, but would need to be compensated for. As an area of 0.93ha of wetland will be removed and/or impacted, an area of 0.941ha (slightly more than required) has been added to the ecological buffers to compensate for the impact to the wetlands. However, it is proposed that the compensation wetlands be created within the ecological buffers, as the area is more suitable to wetland creation due to topography and being adjacent to the woodlands and existing wetlands, and to allow for the establishment of a minimum 15m buffer from the proposed development blocks. The proposed wetland compensation area is shown on Map 7b and amounts to 1.27ha, which is 0.34ha larger than required. As per Section 5.1 of the EMG (City of London 2021), ecological buffers are not intended to contribute to feature-based compensation goals, but the area required for compensation (0.93ha), has been added to the ecological buffers to ensure no net loss of natural area. As noted above, the area of these compensation lands is slightly larger than required, at 0.94ha, which has been added to the 30m Significant Woodland buffer. This recommendation results in a greater than 30m buffer to the Significant Woodland in most areas, and the proposed creation of a contiguous and higher quality wetland feature adjacent to the existing Meadowlily Woods ESA.

The constructed wetland area is to be graded, outside of the Significant Woodland dripline limits, to achieve suitable water attenuation that can facilitate long-term wetland plant establishment, without damaging the roots of the trees within the woodland. Groundwater monitoring completed by Stonecairn suggests that there are shallow groundwater conditions within the proposed wetland compensation area. Additional groundwater monitoring is recommended in the wetland compensation areas to determine grade levels that will allow hydrologic connection of the remaining MAM2 community parcels and the creation of additional suitable Terrestrial Crayfish habitat. Furthermore, the wetland compensation area offers the potential to receive clean surface and stormwater runoff through the implementation of LID mitigation measures within Block 5, such as from clean roof water.

Detailed grading limits and a Vegetation Planting Plan will be submitted at the detailed design stage of the project. The planting plan is to comprise all native species that will be locally sourced with a target community of Swamp Thicket. The additional compensation lands are likely to be planted with trees and shrubs to compensate for the removal of individual trees and further buffer the existing natural heritage features from potential encroachment impacts.

7.2.2 Significant Valleyland Impacts

A component of the Fekete Drain crossing and internal road development is anticipated to impact the Significant Valleyland (measured 30m from either side of the watercourse top-of-slope) that is located south of the Meadowlily Woods ESA. Given the transportation constraints of the subject lands, avoidance of the Significant Valleyland is not feasible. The areas to the north and south of the proposed impacted Significant Valleyland will be enhanced through wetland compensation and the improvement of other designated compensation lands.

The proposed Fekete Drain road crossing is anticipated to consist of a 41.5m long 1.8mx3.9m concrete box culvert with a 0.27% slope which is anticipated to meet or exceed the MNR requirements for crossings in regulated areas. Final culvert crossing designs will be determined during the detailed design phase and should be designed to facilitate the movement of both water and wildlife within and along Fekete Drain.

7.2.3 Cultural Woodland Impacts

The CUW community located in the southwest corner of the subject lands will be cleared to facilitate the proposed development. As this feature is not considered significant, 1:1 land compensation is not required. Furthermore, this feature is not located with the City's designated Tree Protection Area (Map 1). A Tree Inventory and Preservation Plan (TIPP) will be conducted at the detailed design stage of the project to assess tree removals within the subject lands and any required tree compensation. Area is available with the additional compensation lands to accommodate tree compensation plantings.

7.3 Multi-Use Pathway

Map 4 of the London Plan identifies 'Cycling and Walking Routes' on the subject lands. At the City's discretion, pathways or trails may be permitted within natural feature buffers as long as they are implemented in accordance with Section 5.4 of the EMG and an approved EIS.

In the City of London, "pathways" typically refers to paved multi-use paths intended to support community health, mobility, connectivity and the active transportation network. These pathways consist of a maximum of 3m paved width with 0.5m to 1.0m of mown grass for clearance on either side, for a maximum total width of 5m (City of London 2021). "Trails" in the City of London refers to a range of unpaved but still formal connections intended to support passive activities such as hiking and nature enjoyment (City of London 2021).

A “pathway” rather than a “trail” is proposed within the subject lands. A potential pathway route has been identified on Map 7c. The pathway is generally proposed along the development limit, offset from the development block (Blocks 1 and 5) by 1m. The pathway will be integrated with the road crossing the Fekete Drain. The pathway is to connect to the adjacent property to the west, which is slated for future development. North of Block 5, it is proposed the pathway cross the existing wetland at its narrowest point, as shown on Map 7c, which should consider the habitat and water movement in its design, such as through a boardwalk. The pathway shown on Map 7c is conceptual at this point. Its precise alignment is to be determined at the detailed design stage in consultation with the City.

7.4 Impact and Net Effects Assessment

The potential impacts are determined by comparing the characteristics of the existing natural features and their functions to typical residential and construction activities and processes. Where a development proposal overlaps or is adjacent to natural features, impacts may arise.

The following is a description of the types of impacts that have been assessed based on the concept plan.

- **Existing** impacts are discussed in relation to impacts from previous or existing land uses or activities that have affected the natural heritage features of the subject lands.
- **Direct** impacts are discussed in relation to the natural features and wildlife on the subject lands associated with disruption or displacement caused by any potential future ‘footprint’ of the undertaking.
- **Indirect** impacts are discussed in relation to changes in site conditions such as drainage and water quantity/quality on the subject lands and adjacent communities, as well as impacts that may occur following construction of the development.

7.4.1 Evaluations of the Potential Effects, Mitigation and Net Effects

Impacts, mitigation measures, other recommendations, and net effects are detailed in Table 17. The table details the impact of all components of the proposed development.

Table 17. Impact Assessment, Mitigation, and Net Effects

SOURCE OF IMPACT	POTENTIAL AREAS AFFECTED & POTENTIAL EFFECTS	AVOIDANCE, MITIGATION, COMPENSATION	NET EFFECTS & RATIONALE
1.0 Existing Impacts			
1.1 Invasive weed (Glossy Buckthorn) growth in forest understorey	The CUP3-2 and CUP3-3 communities. Reduced plant species diversity due to competition from invasive weeds.	Prepare and implement an Environmental Management Plan to selectively remove Glossy Buckthorn.	(+) Net Positive Effect Removal of invasive plants allows for native plants to colonize and increase diversity and prevents establishment in proposed compensation areas.
2.0 Direct Impacts			
2.1 Site Clearing and Vegetation Removal *Tree Inventory and Preservation Plan not yet completed to address removal of CUW and isolated trees.	Site clearing and vegetation removal has the potential to damage tree root systems, destabilize soils, change hydrological flow patterns, and remove wildlife habitat. In addition to isolated tree removals, the following vegetation communities are proposed to be removed. • CUW community (0.34ha) • MAM2 (0.75ha)	The Significant Woodlands and components of the ESA are protected to the greatest extent possible, as shown on Maps 6 and 7a. Removal of vegetation communities has generally been limited to cultural communities or communities that provide limited ecological function. Where the removal of vegetation communities has been proposed, lands have been identified for compensation and restorations plantings within Blocks 6, 7, 8, and 10. These blocks are primarily adjacent to the Meadowlily Woods ESA and the southern Significant Valleyland and Fekete Drain limits (Map 7a and 7b). A total area of 1.27ha has been identified as direct wetland compensation area, while an additional 0.941ha of lands have been added onto the ecological buffers to offset the removal of wetland area (0.75ha) and impact to wetlands within 15m of the proposed development (0.18ha). Furthermore, it is anticipated that Blocks 6, 7, and 8 can provide ample space for potential tree removal compensation plantings.	(+) Net Positive Effect With proposed compensation and restoration area plantings, and adherence to wildlife timing windows, no significant net effects are expected. The incorporation of robust native plantings along the ESA and southern Significant Valleyland edge will greatly improve the ecological form and function of these contiguous features by providing a corridor that is >80m wide (notwithstanding the drain crossing) and provides enhanced hydrological, wildlife habitat, and wildlife movement functions. By maintaining and providing significant ecological improvements to the edges of the ESA and southern corridor, the proponent will ensure the protection and enhancement of significant natural features within the subject lands. The improved compensation lands will provide direct wildlife habitat, wildlife movement habitat,

SOURCE OF IMPACT	POTENTIAL AREAS AFFECTED & POTENTIAL EFFECTS	AVOIDANCE, MITIGATION, COMPENSATION	NET EFFECTS & RATIONALE
		The removal of trees and all vegetated areas associated with the proposed development has the potential to disrupt nesting birds. The Migratory Birds Convention Act (MBCA, Government of Canada 1994) identifies a list of migratory bird species that are protected. It prohibits the destruction of nests, individuals and activities that would cause an adult bird to abandon a nest. Tree and vegetation removal is to occur outside of the core nesting period for migratory birds as established by the Canadian Wildlife Service (CWS) which extends from approximately April 1 – August 31 (Government of Canada 2018). Every developer, consultant, contractor, etc. is legally obliged to carry out due diligence to protect migratory birds from harm during all construction projects. Should vegetation/tree removal be required to occur within the peak breeding bird window, nest surveys may be conducted by qualified biologists within simple habitat (e.g., hedgerows, individual trees, or other areas where the probability of finding nests is high) just prior to the removal activity (less than 48 hours prior to) to ensure that nesting birds are not present. Should any nest be identified in a vegetated area or tree(s) to be removed, there shall be no removal or construction activity until sign-off is obtained from the qualified biologist that the nest is no longer active. See Table section 2.4 Tree Removal, for SAR bat considerations.	and robust protection to the hydrological system.
2.2 Wetland Removal	Removal of wetlands can result in direct wildlife mortality, the removal of wildlife habitat, alter hydrologic flow patterns and change water balances. Four small non-significant wetland	Wetlands within the subject lands have been retained and buffered wherever possible. Four small sections of MAM2 are proposed for removal to allow for developable space within the subject lands and the proposed Fekete Drain crossing. The removal of these	<u>No Net Effect</u> The proposed construction of the compensation wetlands will provide an area of wetland larger than the four wetland

SOURCE OF IMPACT	POTENTIAL AREAS AFFECTED & POTENTIAL EFFECTS	AVOIDANCE, MITIGATION, COMPENSATION	NET EFFECTS & RATIONALE
	parcels are proposed for removal from within the subject lands. • MAM2 (0.75ha) • Impacted MAM2 (0.18ha)	wetlands as well as a proposed reverse impact buffer of 15m for the remaining wetlands that aren't buffered will be compensated for within Block 10 as shown on Map 7b. To provide a minimum of 1:1 compensation for the wetland and ensure feasibility of on-site compensation, up to 1.27ha of created wetland is proposed within the Significant Woodland buffer (Block 10). By utilizing space within Block 10, the new wetland will be located closer to the floodplain and will be located within a connected system of aquatic and upland habitat. Improved linkages will facilitate movement of wildlife between habitats. The integrated corridor will provide greater ecological connectivity and habitat diversity than the current system in the subject lands. A wildlife salvage should be undertaken prior to wetland removal. The constructed wetland will be planted with a wide variety of native species and will include marsh and wetland thicket components to provide diverse wildlife habitat and ecological function. A design and planting plan for the compensation wetland should be developed at the detailed design stage. This plan should integrate detailed water balance assessment results to ensure the development of additional Terrestrial Crayfish habitat and water attenuation that supports the establishment of wetland species. Section 7.2.1 of this EIS provides more detailed information on the proposed wetland compensation approach.	portions that are proposed to be removed. The constructed wetland will provide a larger area of contiguous habitat in addition to a buffer area. Habitat within the constructed wetland is proposed to be of a higher quality then that present in the removed wetlands, with a high diversity of native plant species. The wetland will be located in proximity to the existing floodplain for the Fekete Drain and will be designed to collect surface runoff and overland flood water, as well as through implementation of LID measures within the development blocks. It can take several years for constructed wetlands to become established; for this reason, the impact has been considered to have no net effect. In the long-term it is anticipated that the constructed wetland will provide higher quality wildlife habitat and ecological functions than the wetlands proposed for removal.
2.3 Fekete Channel Road Crossing	The new Fekete Drain crossing structure has the potential to result in the harmful alteration, disruption, or destruction of fish habitat or the death	Alteration or construction within 30m of the highwater mark of Fekete Drain should be minimized wherever possible. The new Fekete Drain road crossing structure	<u>No Net Effect</u>

SOURCE OF IMPACT	POTENTIAL AREAS AFFECTED & POTENTIAL EFFECTS	AVOIDANCE, MITIGATION, COMPENSATION	NET EFFECTS & RATIONALE
	of fish, as a result of the footprint of the new crossing structure or changes to surface water flow patterns.	within the area and below the highwater mark is proposed to facilitate road access to the subject lands. This new crossing structure will be designed to minimize the foot print both below the highwater mark, within the vicinity of Fekete Drain and within downstream resources. A comprehensive engineering analysis for the new crossing structure should be completed at the detailed design stage. This should involve a hydrology study report that will include an environmental management plan (including any required compensation), construction methodology, and ESC measures for the implementation of the new crossing structure. The design of the Fekete Drain crossing should incorporate a large opening to allow wildlife to travel along the Fekete Drain corridor unimpeded. The crossing should provide both wet and dry substrates for wildlife movement and should have an open bottom. All in and near water construction activities should be completed in accordance with the MNR's in-water work timing window guidelines timing (in-water work restricted March 15-July 15). Following the determination of the final crossing structure design each component within 30m of a mapped high watermark will be assessed as they relate to the DFO's Pathways of Effects, Codes of Practice, and Fish and Fish Habitat Protection Policy Statement to determine the potential impacts to fish and fish habitat within the study area and identify appropriate mitigation and avoidance measure. In the event that all measures cannot be implemented completely further review by the DFO will be required, in the form of a DFO Request for Review under the Fish and Fish Habitat Protection Program.	The proposed Fekete Drain road crossing is not anticipated to have any net effects, as long as the structure is appropriately designed and evaluated during the detailed design stage. The proposed structure will be further evaluated through a comprehensive impact analysis once further details of its construction are understood and following approval from the DFO, if required.

SOURCE OF IMPACT	POTENTIAL AREAS AFFECTED & POTENTIAL EFFECTS	AVOIDANCE, MITIGATION, COMPENSATION	NET EFFECTS & RATIONALE
2.4 Tree Removal	Candidate habitat for SAR bats has been identified within treed communities on the subject lands. Based on the site review, no candidate bat roosting trees were identified within CUW and or isolated treed features that are anticipated for removal (southeast and southwest corners).	Vegetation removal should be conducted outside the bat active season (April 1 to November 30) to ensure that no direct mortality of SAR bats occurs. A Tree Inventory and Preservation Plan is recommended during detailed design to identify the number and condition of trees to be removed. Tree compensation measures, are to be determined through this process, in accordance with City guidelines. A bat habitat assessment is to be undertaken of all trees proposed for removal. NRSI biologists will then determine whether or not SAR bats may be impacted through tree removal or not, and will advise the client of next steps, such as avoiding tree removal during the bat active season to the greatest extent possible.	Not Net Effect At this stage, no impacts to SAR habitat or contravention of the Endangered Species Act is anticipated, as long as the recommended mitigation measures are implemented.
2.5 Site Grading *Grading limits associated with the creek crossing have been identified as a “worst case scenario” and are expected to be reduced during detailed design.	Site grading has the potential to cut or compress tree root systems, change hydrological flow patterns, destabilize slopes, and remove wildlife habitat.	Grading will be limited to areas located within the proposed development limit, which has been designed to avoid natural heritage features and buffers. Very limited areas of encroachment have been identified within the southern Significant Woodland buffer due to the proposed drain crossing. It should be noted that the proposed drain crossing is considered a “worst case scenario.” It is anticipated that grading encroachment into the Significant Woodland buffer will be reduced through detailed design of the road crossing. Limits of development will be clearly marked in the field to prevent encroachment into the surrounding natural features. These boundaries will be clearly marked using Erosion and Sediment Control (ESC) fencing and/or Tree Protection Fencing. These measures are to be implemented to ensure any activities associated with the development are restricted to lands outside of natural areas and their buffers. The fencing is to be installed prior to the commencement of construction.	No Net Effect Impacts related to grading are expected to be minimized and low in impact due to the mitigation measures proposed. ESC measures and sediment control facilities will be provided in all areas and phases where grading, servicing and construction are proposed.

SOURCE OF IMPACT	POTENTIAL AREAS AFFECTED & POTENTIAL EFFECTS	AVOIDANCE, MITIGATION, COMPENSATION	NET EFFECTS & RATIONALE
		The Clean Equipment Protocol (Halloran et al. 2013) is to be followed to reduce the risk of introducing invasive species to the site. A TIPP is to be prepared at the detailed design stage. The TIPP will identify the location of Tree Protection Fencing to ensure that site grading does not impact tree root zones. Hydrological patterns will be maintained, as per the Preliminary Stormwater Management Report prepared by DevEng (2025). A detailed ESC Plan as per the City of London Design Standards Requirements (2021c) should be prepared and implemented. This is to include regular monitoring and maintenance of ESC mitigation measures.	
2.6 Grading Associated with Wetland Creation	Site grading has the potential to cut or compress tree root systems, change hydrological flow patterns, destabilize slopes, and remove wildlife habitat.	Minimal grading is expected within the proposed area of wetland creation (Map7b). There are existing topographic low areas that should be connected to facilitate hydrologic flow and wetland plant growth. A grading plan is to be provided at the detailed design stage and will not propose grading within the Significant Woodline dripline. The grading plan will be designed to avoid root impact to edge trees.	<u>No Net Effects</u> Impacts related to grading are expected to be minimized and low in impact due to the mitigation measures proposed. Further mitigation measures will be addressed at the detailed design stage.
2.7 Buffer Encroachment / Reduction	A minor grading encroachment / buffer reduction is proposed within the Significant Woodland and the Terrestrial Crayfish buffer as shown on Map 6. This buffer encroachment / reduction is required due to the transportation constraints of the subject lands. Encroachment into the Significant Woodland buffer area can result in increased edge effects during and post-construction.	The identified buffer encroachment is minor in scale and is required to allow for transportation services within the subject lands. The road crossing of Fekete Drain has been shifted as far south as possible, but must maintain the required distance from Hamilton Road. In order to prevent edge effects and additional encroachment into buffer areas during construction, the limit of development should be marked in the field. After grading is finished, bare areas of the buffer are to	<u>No Net Effects</u> Through the implementation of the recommended mitigation measures, damage to vegetation and potential Terrestrial Crayfish individuals will be limited to the greatest extent possible. No net effects are anticipated.

SOURCE OF IMPACT	POTENTIAL AREAS AFFECTED & POTENTIAL EFFECTS	AVOIDANCE, MITIGATION, COMPENSATION	NET EFFECTS & RATIONALE
	Grading encroachment into the Terrestrial Crayfish buffer area can result in direct harm to individuals, reduced habitat, and destruction of newly created burrows and suitable burrowing habitat.	be re-seeded, the southern Significant Woodland limit will be provided a minimum 20m buffer from the proposed road crossing. As mentioned in row 2.5, this encroachment is considered a worst-case scenario with potential for impact reductions at the site plan stage. In order to mitigate impacts to potential Terrestrial Crayfish individuals, prior to grading, the area will be surveyed for the presence of Crayfish chimneys. Should any chimneys be identified at that time, efforts to capture Terrestrial Crayfish individuals will occur and may involve physical excavation of burrows or use of an alternative methodology determined by a qualified Ecologist. Individuals will be relocated to Block 10 in the other area of confirmed Terrestrial Crayfish SWH. The creation of new wetlands in closer proximity to the Fekete Drain and Significant Woodland is expected to increase the suitable habitat for Terrestrial Crayfish. No equipment or construction materials are to be stored within buffers.	
2.8 Pathway	The creation of a Cycling and Walking route within the outer buffer of the natural heritage features can result in increased edge effects, garbage dumping and further unauthorized trails and or off-leash animals. It is the City's recommendation that a Cycling and Walking Route is proposed within the subject lands as per Map 4 of the London Plan.	As per the EMG, the City is generally of the position that pathways may be incorporated into ecological buffers provided they are designed to support ecological function and located in the outer half of the buffer. The proposed pathway will be off-set from Blocks 1 and 5 by approximately 1m; however, to avoid bisecting a larger area of the northern MAM2, the pathway is proposed to cross at its narrowest point (Map 7c). Note that this may require a boardwalk to avoid disturbance to the existing and created wetland. Generally, to avoid impacts, the pathway is located at	<u>No Net Effects</u> Through the implementation of the recommended mitigation measures, damage to natural heritage features and their buffers will be limited to the greatest extent possible. No net effects are anticipated.

SOURCE OF IMPACT	POTENTIAL AREAS AFFECTED & POTENTIAL EFFECTS	AVOIDANCE, MITIGATION, COMPENSATION	NET EFFECTS & RATIONALE
		the outer limit of the proposed buffers/compensation block (Block 9). A paved pathway will help to formalize where public can enter the subject lands and will avoid unauthorized trails that often occur during muddier conditions. To mitigate against potential dumping, garbage bins that are emptied regularly are recommended at certain pathway entry points. Signage can also be used to direct public away from private and protected property. In addition, the development boundary is proposed to be fenced to keep blowing trash out of the natural areas, which will also dissuade dumping. Plantings should be denser on the natural feature side of the pathway, and comprise thorn baring species to deter encroachment into the natural features.	
2.9 Damage to Vegetation	Damage to trees and vegetation adjacent to the proposed development area can occur during construction activities. This can result in scarring and damage to vegetation by machinery, the decreased health of vegetation from dust and sedimentation, and the introduction of non-native species.	Implementation of the buffers identified on Map 6 and delineation of their boundaries with ESC fencing, tree protection fencing, or other visual markers will prevent encroachment into these areas and limit the potential for unintended vegetation damage. A TIPP will be prepared at the detailed design stage and will identify locations where tree protection fencing will be installed to prevent damage to trees adjacent to the development area or proposed for retention. Development and implementation of ESC plan. The City of London's Clean Equipment Protocol should be followed to minimize the spread of invasive species.	<u>No Net Effects</u> Through the implementation of the recommended mitigation measures, damage to vegetation will be limited to the greatest extent possible. No net effects are anticipated.
2.10 Machinery Maintenance	Maintenance and refueling of construction machinery and equipment can result in the potential contamination of soils, vegetation, and water.	All machinery maintenance should be completed in designated areas away from natural features and buffers, and at a high elevation point on-site where possible.	<u>No Net Effect</u> All potential impacts relating to machinery and equipment maintenance can be

SOURCE OF IMPACT	POTENTIAL AREAS AFFECTED & POTENTIAL EFFECTS	AVOIDANCE, MITIGATION, COMPENSATION	NET EFFECTS & RATIONALE
		Best management practices are to be implemented during construction, which are to include: development of a spill action response plan and development of a spill contingency plan for fuel handling, storage, and on-site equipment maintenance activities. Large buffers and additional compensation lands adjacent to natural heritage features will protect these from impact. Contractors on-site should ensure construction equipment is in good working order. Equipment operators should have spill prevention kits available.	mitigated through the implementation of the detailed measures and Best Management Practices.
3.0 Indirect Impacts			
3.1 Hydrological Changes – SWM and Water Balance Functional Stormwater Management Report provides additional information (DevEng 2025) Hydrogeological Report (Stonecairn 2025)	Changes to stormwater drainage on the subject lands can result in impacts to wetland features, Fekete Drain, as well as off-site wetlands, watercourses, and other natural features. The impacts have the potential to result in increased surface water runoff, decreases to water quality, and changes to water balance. Construction activities can result in contamination of surface water features. These impacts are short term and can be minimized through the implementation of mitigation measures.	On-site SWM quantity controls are proposed for implementation as permanent private systems within each of the proposed development blocks. The application of lot based stormwater management systems as descrbied in the preliminary SWM report (DevEng 2025) are anticipated to address flow for up to a 100-year design storm, with overflow capacity for the safe conveyance of up to a 250-year rain event. Specific designs of the lot based permanent private systems will be developed during the detailed design phase, but are anticipated to include oil/grit separators and treatment-train systems to meet the “normal” treatment objectives (70% TSS removal). Construction-stage measures should be implemented to ensure that sediment and spills be prevented from migrating off-site into the adjacent	<u>To be determined. The goal: No Net Effect</u> Based on the preliminary SWM management report (DevEng 2025) and Hydrogeological Report (Stonecairn 2025), no long-term negative effects are anticipated as they relate to water quantity and quality impacts. The proposed SWM strategy will provide sufficient space to attenuate stormwater flows to pre-development rates. Quality controls will be implemented to ensure water quality meets the required 70% TSS removal.

SOURCE OF IMPACT	POTENTIAL AREAS AFFECTED & POTENTIAL EFFECTS	AVOIDANCE, MITIGATION, COMPENSATION	NET EFFECTS & RATIONALE
		natural heritage features. These measures should be incorporated into an ESC plan for the development.	A final SWM plan, including lot based permanent private systems, is to be developed at the detailed design stage and impacts re-evaluated to ensure no net negative effect is anticipated. Water balance calculations and mitigation measures are to be updated and addressed through focused design studies at Site Plan approval. Post-construction water balance for the wetlands on site should be within (+/-) 10% of the pre-development conditions.
3.2 Impacts / Disturbance to Adjacent Natural Features and Wildlife Habitats *During construction phase	Indirect disturbances can cause stresses on the natural features that weaken their ecological integrity. In these states, natural features are more prone to establishment and proliferation of invasive, non-native species. Proliferation of invasive, non-native species within natural communities decreases their ecological value by suppressing native species, diminishing biodiversity, and reducing habitat suitability. Increased disturbance of wildlife caused by excessive noise, dust, vibrations, lighting, and proximity of human presence during and following construction may cause certain species to abandon or avoid the area for travel, foraging, or nesting. Additionally, these disturbances may disrupt or discourage breeding birds from nesting within the vicinity.	Limits of development will be clearly demarcated to prevent encroachment into the surrounding natural features. Large buffer areas have been included in the natural heritage system to protect natural features, which includes an additional setback area as compensation lands. To avoid and minimize potential for invasive, non-native species, the clean equipment protocol is to be followed, and restoration of the buffer and management of existing non-native species is to be implemented. In order to suppress dust, areas of bare soil should be moistened with water during construction activities to ensure that the amount of dust within the subject lands is reduced. Topsoil stockpile locations should be in areas of lesser wind exposure and away from natural features and their buffers. Stockpile height should be limited as much as feasible to maintain soil health. Topsoil piles should not have vertical sides, to prevent Bank Swallows (*Riparia riparia*) from nesting in the pile, as this is a SAR.	<u>No Net Effect</u> Through the implementation of the proposed mitigation measures, impacts resulting from construction related dust, noise, and vibrations are expected to be temporary, minimal, and localized during the construction of the proposed development. Significant effects on wildlife are not anticipated and it is expected that displaced wildlife species adjacent to the site will return to the subject lands following construction. Directional lighting, construction schedules, soaking exposed soils, and fencing should effectively ensure that there are no net impacts.

SOURCE OF IMPACT	POTENTIAL AREAS AFFECTED & POTENTIAL EFFECTS	AVOIDANCE, MITIGATION, COMPENSATION	NET EFFECTS & RATIONALE
		Impacts resulting from increased noise and vibration can be mitigated by restricting the daily timing of construction activities to between 7:00am and 7:00pm. All lighting equipment associated with construction should be turned off during non-operational hours or at the very least should be directed away from adjacent natural features to prevent “lightwash” of these areas. Lighting of industrial / commercial buildings and access roads should also be directed away from the natural heritage system. Parking and/or loading areas should be fenced where they border the natural heritage system. Chain-link or wooden fencing would be most appropriate for this. To allow workers/public to access the proposed pathway, gaps in the fence may be considered.	
3.3 Erosion and Sedimentation *During construction phase	During construction, areas of bare soil may be exposed that have the potential to erode during precipitation events and impact adjacent natural features. In the event of a heavy rain or snow melt event, sediment laden runoff can enter adjacent natural areas by way of overland flow.	ESC fencing will be required as part of an ESC Plan. Disturbed areas should be kept to a minimum and re-vegetated in a reasonable timeframe in order to minimize dust and erosion. Regular and timely inspection and maintenance of the installed ESC measures throughout the duration of construction is to be undertaken to ensure these measures are functioning as intended. ESC measures are to be removed from the site following construction and once soils have been stabilized through vegetation.	<u>Not Net Effect</u> Through the design and implementation of a proper ESC plan, no significant net impacts are expected due to erosion and sedimentation.
3.4 Salt run-off from Maintenance	Excessive salts or other additives for ice and snow control on roadways and parking lots can enter adjacent natural areas and Fekete Drain by way of	It is recommended that a Salt Management Plan be completed for the subject lands at the detailed design stage. The purpose of the Salt Management Plan should be to reduce the impact of winter maintenance	<u>Not Net Effect</u> Through the design and implementation of a proper Salt Management Plan, net

SOURCE OF IMPACT	POTENTIAL AREAS AFFECTED & POTENTIAL EFFECTS	AVOIDANCE, MITIGATION, COMPENSATION	NET EFFECTS & RATIONALE
	overland flow which can impact plant growth and reduce water quality.	activities involving salt application on surface water and groundwater and would include operational practices and strategies to minimize and monitor salt use. Snow storage locations should be located where runoff is into a Catchment that does not drain towards Fekete Drain and or the natural heritage features and their buffers.	impacts from salt are expected to be minimized as much as possible.
3.5 Use of natural areas as a result of the development	Natural features and proposed buffers that are located adjacent to the development area can be impacted through increased use of a natural area by public or users of the property, feral and domestic wildlife, and unauthorized trail/pathway construction.	Permanent fencing should be installed along the rear lots of Block 1 and Block 5 that back onto natural features and buffer areas. To allow workers/public to access the proposed pathway, gaps in the fence may be considered. As the proposed development is industrial / commercial, increased human presence is not anticipated as compared to a proposed residential development. Through the use of fencing, public can be deterred from accessing or dumping within the natural features and their buffers. It is anticipated that employees / workers will not create unauthorized trails and public visitors are unlikely to wander into the natural features after visiting the commercial buildings. It is recommended that garbage disposal bins (i.e., dumpsters) are located away from the edge of natural features and buffer areas. The use of chain-link or wooden fencing will keep litter from blowing into the natural areas. A multi-use pathway will provide a walking and cycling path, reducing the probability for the creation of ad hoc trails. The pathway will clearly delineate the ESA. The increase in noise, traffic and artificial lighting resulting from the proposed industrial / commercial development can disrupt or deter sensitive wildlife from	<u>Not Net Effect</u> Through the correct use of these mitigation measures, it is anticipated that the effects of the induced impacts will be small in magnitude. These impacts have the potential to be permanent, although they can be reduced at any point through education and enforcement.

SOURCE OF IMPACT	POTENTIAL AREAS AFFECTED & POTENTIAL EFFECTS	AVOIDANCE, MITIGATION, COMPENSATION	NET EFFECTS & RATIONALE
		inhabiting the edge habitats on site. It is recommended that low intensity, downward-projected road lighting be installed. The large buffers with increased setbacks through compensation areas protect the existing natural heritage features on site. It is anticipated that the proposed compensation plantings will further buffer interior sensitive features from noise and light pollution, as will the naturalization of the proposed buffers.	

8.0 Environmental Management Recommendations

8.1 Planning and Design Stage

1. A grading plan for the proposed development will be developed at the detailed design stage.
2. A TIPP should be prepared to address proposed tree removals from the subject lands and to determine compensation requirements. The TIPP will also identify the location of Tree Protection Fencing.
3. A bat habitat assessment should be undertaken together with the tree inventory to assess any potential impacts to SAR bats, where tree removals are proposed.
4. A detailed SWM Plan is to be developed at the detailed design stage. This plan should identify specific stormwater quantity and quality controls, and promote clean discharge to the created wetland areas. An updated water balance assessment should be provided as part of this plan to ensure that no negative changes to the wetland water balance will occur as a result of the proposed development.
5. A Restoration Plan will be developed at the detailed design stage. This plan will include a planting plan for the buffer areas and the compensation areas. The Restoration Plan is to solely include native species local to the City of London. The planting plan will incorporate compensation for tree removals (as specified in the TIPP) and enhancement plantings within the buffer areas.
6. A detailed design plan should be developed for the constructed wetland proposed in the Significant Woodland buffer. This plan should address hydrologic requirements for the wetland. It should also include a planting plan for the wetland as well as its associated buffer area. The proposed plantings should include the native species that will target the creation of a Swamp Thicket community.
7. A detailed design of the crossing structure proposed for the Fekete Drain crossing should be developed. The proposed design should allow for wildlife movement. An impact analysis should be completed for this structure to ensure that it functions as intended and does not impede the movement of terrestrial and aquatic wildlife along the Fekete Drain corridor.
8. A separate Environmental Monitoring Plan (EMP) should be developed in accordance with the City's EMG (2021). The EMP should be developed in conjunction with the first submission of engineering drawings and will identify a 5-

year detailed monitoring program for natural heritages features and functions. The requirements are anticipated to include invasive species management and monitoring of mitigation measures installed within the subject lands during construction. Post-construction monitoring is expected to include monitoring of plantings within the buffer as well as the constructed wetlands, to the satisfaction of the City. An annual monitoring report shall be provided each year of the program to the City's Ecologist.

9. A detailed ESC plan should be developed by a qualified engineer for implementation during construction. This plan should include all proposed ESC measures, including but not limited to ESC fencing, straw bales, and check dams.
10. A detailed design of the Fekete Drain crossing should be developed. An impact analysis should be completed for this structure to ensure it functions as intended and does not impede the movement of terrestrial and aquatic wildlife along the Fekete Drain corridor.

8.2 Construction Stage

11. ESC fencing is to be installed along the entirety of the development limit to prevent erosion and sedimentation and to demarcate the development area in the field. No construction staging shall be permitted within the natural areas or their buffers.
12. ESC measures on the subject lands will require certification by the Contract Administrator and the construction monitoring program will be maintained during site development, until 70% buildout. This will not be restricted to the establishment of ESC controls, but to on-going maintenance such as active lot drainage control, street sweeping, stockpile seeding, etc.
13. A combined ESC fence and tree protection fence is recommended where trees are situated along the development limit. The installation and location of the tree protection fence is to be inspected by a Certified Arborist before any construction activities begin, and maintained by the developer during the entire construction period. Any minimal damage (i.e., damage to limbs or roots) to trees to be retained during construction must be pruned using proper arboricultural techniques. Should any of the trees intended to be retained be seriously damaged or die as a result of construction activities, consultation with the City will be required. More information regarding tree protection fencing will be provided in the TIPP that is to be developed at the detailed design stage.

14. The constructed wetlands should be implemented prior to the removal of the MAM2 areas within the subject lands.
15. Stabilization and re-vegetation of bare soil areas after grading should be completed as soon as possible.
16. Tree and vegetation removals should be restricted to outside the peak breeding season window for migratory birds (April 1-August 31) and the active season for bats (April 1 – November 30).
17. In and near water works should be restricted to outside of the in-water work restriction timing window (March 15 – July 15).
18. A spill action response plan and spill contingency plan should be developed prior to the initiation of construction activities.
19. The City of London's Clean Equipment Protocol should be followed to minimize the spread of invasive species.
20. In order to suppress dust, areas of bare soil should be moistened with water during construction activities to ensure that the amount of dust within the subject lands is reduced.
21. Topsoil stockpile locations should be in areas of lesser wind exposure and away from natural features and their buffers. Topsoil stockpiles should be graded to ensure they do not have/develop vertical banks, which could entice Bank Swallows from nesting in the pile. Topsoil pile height should be minimized as much as feasible.
22. Construction activities should be restricted to 7:00am to 7:00pm, with artificial lighting turned away from natural features.
23. The design of directional lighting fixtures should be compliant with International DarkSky Association standards.

8.3 Post-Construction Stage

24. Stabilization and re-vegetation of bare soil areas after construction is complete should be undertaken as soon as possible. Vegetation is less effective in the summer and winter months; other stabilization methods should be used until planting conditions are appropriate.
25. Tree protection and ESC fencing should be removed upon completion of construction activities. A Certified Arborist should be on site to monitor the removal of the Tree Protection Fencing and inspect retained trees and their rooting area.

Possible remediation work may be needed if retained trees or root zones are damaged.

26. A 2-year monitoring plan, which is to be described in the proposed EMP, should be implemented to observe survival of planted trees and vegetation within the buffer areas of the subject lands.
27. A comprehensive 5-year monitoring plan, which is to be described in the proposed EMP, should be implemented to assess the establishment of the constructed wetlands and to ensure that the proposed industrial / commercial development has no negative impacts on surrounding natural features and buffer areas post-construction and post-development.
28. A detailed Salt Management Plan should be completed for the subject lands and implemented to avoid indirect impacts to adjacent natural heritage features and the water quality of Fekete Drain.
29. Permanent fencing (chain link or wooden fence) should be installed along the rear lots of Block 1 and Block 5 that back onto natural features and buffer areas. To allow workers/public to access the proposed pathway, gaps in the fence may be considered.

9.0 Conclusion

NRSI was retained in 2021 by Kreative Development Inc. to complete an EIS for the proposed development located at 2004 Hamilton Road. The proposed development includes a mixture of commercial and industrial development blocks and associated roads, including a proposed crossing over Fekete Drain. This EIS follows the submission of a Subject Lands Status Report, dated October 2024 (NRSI).

Comprehensive buffers have been identified for significant and sensitive natural features within the subject lands. Several small vegetation communities and portions of vegetation communities are proposed for removal from the subject lands in support of the proposed development. The removal of treed vegetation communities will be compensated for within the identified areas of additional compensation lands and restoration plantings will be provided in buffer areas to provide protection from the proposed development. Wetland removal from the subject lands will be compensated for at a >1:1 ratio in Block 10.

A Net Effects Assessment was completed for the proposed development which considered the source of the impacts, potential areas affected, and potential effects. Avoidance, mitigation, and compensation measures were identified, and the overall net effects and rationale provided. As demonstrated in the Net Effects Assessment table (Table 17), assuming the recommended avoidance, mitigation and compensation measures are implemented properly, no negative impacts on the natural features or on their ecological functions are expected to occur.

At this stage of the proposed project, the intent and all requirements of the environmental policies of the City of London Plan, PPS, and other relevant legislation have been met (see Table 1). Recommendations are provided within this report for the detailed design stage of the development to ensure that all relevant policies and regulations continue to be met as recommended.

10.0 References

BioLogic. 2019. Aquatic Habitat Assessment of Fekete Drain Memo. Prepared for 2004 Hamilton Road Ltd.

Bird Studies Canada (BSC), Environment Canada's Canadian Wildlife Service, Ontario Nature, Ontario Field Ornithologists and Ontario Ministry of Natural Resources. 2006. Ontario Breeding Bird Atlas Website. Available: https://www.birdsontario.org/jsp/datasummaries.jsp

Bird Studies Canada. 2009. Marsh Monitoring Program Participant's Handbook for Surveying Amphibians. 2009 Edition. Published by Bird Studies Canada in Cooperation with Environment Canada and the U.S. Environmental Protection Agency. February 2009.

Cadman, M.D., Dewar, H.J., and Welsh, D.A. 1998. The Ontario Forest Bird Monitoring Program (1987-1997): Goals, methods and species trends observed. Technical Report Series No, 325, Canadian Wildlife Service.

City of London. 2021. Environmental Management Guidelines. Prepared by AECOM for the City of London.

City of London. 2020. The London Plan. Adopted by City Council June 23, 2016. Office consolidation November 13, 2019.

Development Engineering Ltd. (DevEng). 2025a. Draft Plan of Subdivision. April 2025.

Development Engineering Ltd. (DevEng). 2025b. Flood Line Delineation Study 2004 Hamilton Road, City of London. April 2025

Development Engineering Ltd. (DevEng). 2025c. Preliminary Stormwater Management Report 2004 Hamilton Road, City of London. April 2025

David, S.M., K.M. Somers, R.A. Reid, R.J. Hall, R.E. Girard. 1998. Sampling Protocols for the Rapid Bioassessment of Streams and Lakes using Benthic Macroinvertebrates, second edition, Ontario Ministry of the Environment, Dorset, Ontario

Dobbyn, J.S. 1994. Atlas of the Mammals of Ontario. Don Mills, Federation of Ontario Naturalists.

Fisheries and Oceans Canada (DFO). 2022. Fish and Mussel Species at Risk Mapping. Last updated Aug 23, 2019. Available online: https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html

Government of Canada. 1985. Fisheries Act (R.S.C., 1985, c. F-14). Revised in 2019.

Government of Canada. 1994. Migratory Birds Convention Act (S.C. 1994. C.22).

Government of Canada. 2022. Species at Risk Public Registry: Species Search. http://www.sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1

Government of Ontario. 2006. Upper Thames River Conservation Authority Regulation 157/06 – Regulation of Development, Interference with Wetland and Alterations to Shorelines and Watercourses.

Government of Ontario. 2007. Endangered Species Act. S.O. 2007, c.6.

Government of Ontario. 2022. Land Information Ontario: Ontario GeoHub. Aquatic Resource Area Survey Point Data. Published: 2009-06-08. Updated: 2022-06-30. Available: https://geohub.lio.gov.on.ca/datasets/

Griffiths, R.W. 1998. Sampling and evaluating the water quality of streams in southern Ontario. Ministry of Municipal Affairs and Housing, Planning Policy Branch, Toronto. Ontario.

Hagerty, T.P. and M.S. Kington. 1992. The Soils of Middlesex County. Prepared for the Minsitry of Agriculture and Food. Ontario

Halloran, J., H. Anderson and D. Tassie. 2013. Clean Equipment Protocol for Industry. Peterborough Stewardship Council and Ontario Invasive Plant Council. Peterborough, ON.

Hilsenhoff, W.L. 1987. An improved biotic index of organic stream pollution. The Great Lakes Entomologist. Vol. 20, No. 1. Pg 31 – 39.

Hilsenhoff, W.L. 1988. Rapid field assessment of organic pollution with a family-level biotic index. J. N. Am. Benthol. Soc. 7(1):65-68.

Jones, C., K.M. Somers, B. Craig and T. Reynoldson. 2007. Ontario Benthos Biomonitoring Network Protocol Manual. Ontario Ministry of the Environment, Environment Canada, National Water Research Institute.

Kavanagh, R.J., L. Wren, and C.T. Hoggarth. 2017. Guidance for Maintaing and Repairing Municipal Drains in Ontario. Version. 1.1. Fisheries and Oceans Canada.

Kilgour, B.W. 1998. Developing an index of nutrient status based on rapid assessment methodology for collecting benthic macroinvertebrates. Prepared by Water Systems Analysts, Guelph, for the Ontario Ministry of Natural Resources, Picton.

Kilgour, B.W. 2000. Assessing impairment of benthic macroinvertebrates in the Humber River watershed using a reference condition approach, 1999. Prepared by Water Systems Analysts Inc, for the Toronto and Region Conservation Authority.

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and its Application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.

MacDonald, G.M. 2003. Biogeography: Introduction to Space, Time and Life. John Wiley & Sons, Inc., NY. p. 406-411

Macnaughton A., Layberry R., Cavasin R., Edwards B., and C. Jones. 2022. Ontario Butterfly Atlas. Updated February 2022. Available: https://www.ontarioinsects.org/atlas/index.html

Ministry of the Environment, Conservation, and Parks (MECP). 2022. Species at Risk in Ontario. Published: 2018-07-12. Updated: 2022-04-01. Available: https://www.ontario.ca/page/species-risk-ontario

Ministry of Municipal Affairs and Housing (MMAH). 2020. Provincial Policy Statement. Toronto, ON.

Ministry of Natural Resources and Forestry (MNRF). 2014. Ontario Wetland Evaluation System – Southern Manual, 3rd Edition, Version 3.3.

Ministry of Natural Resources and Forestry (MNRF). 2015. Significant Wildlife Habitat Ecoregion 7E Criterion Schedule: Addendum to Significant Wildlife Habitat Technical Guide. MNRF, January 2015.

Ministry of Natural Resources and Forestry (MNRF). 2022. Natural Heritage Information Centre (NHIC): Species List for Ontario. Published: 2014-07-17. All Species List Updated: 2022-04-11. Available: https://www.ontario.ca/page/get-natural-heritage-information

Momentum Earth Sciences Ltd. (Momentum). 2025. Geomorphic Assessment Fekete Drain, South Thames River Subwatershed 2004 Hamilton Road, City of London. April 2025.

Newmaster, S.G., A. Lehela, P.W.C. Uhlig, S. McMurray and M.J. Oldham. 1998. Ontario Plant List. Ontario Ministry of Natural Resources, Ontario Forest Research Institute, Sault Ste. Marie, Ontario, Forest Research Information Paper No. 123.

Oldham, Michael J. 2017. List of the Vascular Plants of Ontario's Carolinian Zone (Ecoregion 7E). Carolinian Canada and Ontario Ministry of Natural Resources and Forestry. Peterborough, ON. 132 pp.

Ontario Breeding Bird Atlas (OBBA). 2021. Instructions for General Atlassing. April 2021.

Ontario Breeding Bird Atlas (OBBA). 2021. Instructions for Point Counts. June 2021.

Ontario Centre for Soil Resource Evaluation (OCSRE). 1993. Field Manual for Describing Soils in Ontario. 4th Edition. Ontario Centre for Soil Resource Evaluation. Publication No. 93-1, 62pp.

Ontario Geological Survey (OGS). 2010. Surficial geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release.

Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide. October 2000.

Ontario Ministry of Natural Resources (OMNR). 2010. Natural Heritage Reference Manual for Policies of the Provincial Policy Statement, Second Edition. March 18, 2010.

Ontario Ministry of Natural Resources (OMNR). 2011. Bats and Bat Habitats: Guidelines for Wind Power Projects. First edition. July 2011.

Ontario Nature. 2019. Ontario Reptile and Amphibian Atlas Program: Interactive Range Maps. Accessed October 2019.

Ontario Odonata Atlas Database (OOAD). 2022. Natural Heritage Information Centre, Ontario Ministry of Natural Resources and Forestry. Species list from atlas square 17MH85 queried on January 13, 2020.

Simpson, E. H. 1949. Measurement of Diversity. Nature 163:688.2

Stanfield, L. 2017. Ontario Stream Assessment Protocol. Version 10. Available at: https://trca.ca/app/uploads/2019/06/osap-master-version-10-july1-accessibility-compliant_editfootnoteS1M4.pdf

Stonecairn Consulting. 2025. Geotechnical Investigation & Hydrogeological Assessment 2004 Hamilton Road, London. April 2025

Upper Thames River Conservation Authority (UTRCA). 2014. Middlesex Natural Heritage Systems Study. Middlesex County, Ontario.

Upper Thames River Conservation Authority (UTRCA). 2017. Dorchester Corridor Subwatershed Report Card. London, ON.

Vannote, G.W. Minshall, K.W. Cummins, J.R. Sedell, and C.E. Cushing. 1980. The River Continuum Concept. Canadian Journal of Fisheries and Aquatic Sciences 37:130–137.

Weber, C.I. 1973. Biological field and laboratory methods for measuring the quality of surface waters and effluents. Cincinnati, Ohio, U.S. Environmental Protection Agency. EPA-670/4-73-001.WESA. 2010. Surface Water Quality Monitoring Program Serpent (McCarthy) Ontario. February 2011.